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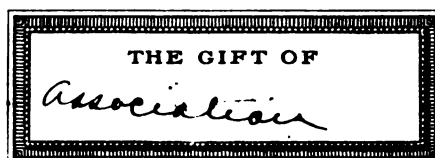
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FOURTH ANNUAL REPORT
OF THE
Association
FOR
Standardizing Paving Specifications
FORMERLY
Organization of City Officials
For Standardizing Paving Specifications

PROCEEDINGS OF THE FOURTH MEETING

HELD AT

PITTSBURGH, FEBRUARY 24, 25, 26, 27, 28, 1913

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JOHN B. HITTELL, Secy-Treas.
5917 WINTHROP AVE.
CHICAGO
—
Price Five Dollars

ASSOCIATION FOR STANDARDIZING PAVING SPECIFICATIONS

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NOTICES

NAME.

In March, 1911, the name was changed to:

ASSOCIATION FOR STANDARDIZING PAVING SPECIFICATIONS

ARTICLES OF ORGANIZATION.

The Articles of Organization are published on page 174 of this volume, and give full information as to membership, associate membership, committees, officers, etc.

NEW MEMBERS.

Albany, N. Y., became a member in April, 1913.

Standard Oil Company of New York became an Associate Member in May, 1913.

DUES.

The annual dues have been abolished.

One membership fee only is required: For cities of 100,000 population, \$50.00; for cities of less population, \$25.00.

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PROCEEDINGS.

Copies of Proceedings for sale upon application to John B. Hittell, Secretary-Treasurer, 5917 Winthrop Ave., Chicago.

PRICE FIVE DOLLARS.

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FOURTH ANNUAL CONVENTION
OF THE
ASSOCIATION FOR STANDARDIZING PAVING
SPECIFICATIONS

FORT PITT HOTEL, PITTSBURGH, PA.

Monday, February 24, 1913.

CAPT. W. J. HARDEE, PRESIDENT: The fourth annual meeting of the Association for Standardizing Paving Specifications will please come to order.

We have with us the distinguished Mayor of Pittsburgh, who desires to extend to the Association and its delegates a cordial welcome to his city. I take pleasure in introducing to you Mayor Magee.

MAYOR MAGEE: Mr. Chairman and gentlemen, I do most heartily welcome your meeting in this city today. When Mr. Sprague, our Superintendent of Bureau of Construction, mentioned the matter to me before your last meeting in New Orleans, he and I agreed that it would be highly profitable to the City of Pittsburgh if you would come here and get a glimpse of our difficult conditions, particularly with reference to the matter upon which your organization is based, the construction of streets.

During the past few years this city has made strenuous and intelligent effort, I might say, to cope with our difficulties. For one thing, we have altered the grades of about seven miles of streets, in some cases reducing grades and in other cases raising them. In one case we reduced the grades on every street covering an area of 33 acres; in another case we raised the streets in an area covering over 40 acres, and in another raised all the streets in an area covering 20 acres. About five miles of streets in these three places, or six miles, and in another place we took one street two miles long and raised it from end to end, and another street about one-half mile long and eliminated a grade crossing and reduced the grade to a maximum of about 13 feet; all of these improvements that I mention being in very, very difficult places. One of them is right in the heart of the business part of the city and is what is known as "The Hump." The others, three of them are along the river bank and were inaugurated for the purpose of keeping out the high water from our rivers in the annual spring freshets, which create quite as much damage here, unfortunately, as they do along the Mississippi River.

Now we think these improvements of ours, by reason of their difficulty, are worthy of exhibition to experts who are engaged in this line of professional work and in addition to those we have had a great many more. I will not recite them to you, for fear that it might seem that we are boasting of some physical achievements that we have accomplished, but I only mention them that you may have some adequate notion of what must be coped with, the variety of physical difficulties that must be coped with in only one community. It is a lesson in municipal economy, the physical difficulties of the City of Pittsburgh.

In your sessions here I have no doubt that we will receive valuable suggestions from you who have been dealing with one or more of the same kind of difficulties in your own localities. I would like to attend one or two of the meetings; I might possibly propound one or two inquiries of a lay character to professional men about things we have here; and while we are at it, I would like to mention just one thing. I presume you have met with this on practically every city—the type of foundation for street car track paving. I know that we have been wrestling with that in this city for more than three years, trying to settle by agreement a question that hardly any three men will agree upon. I am glad to say that we are closer to an understanding and agreement now than we ever were, but we have over a thousand miles of streets and about one-quarter of them or 250 miles are occupied by street car tracks; all of which have to be reconstructed in the course of time, and that is one of our problems that we must have a decision upon, and, of course, we want the wisest conclusion, the one that will permit construction at the lowest cost, that will permit easy running of the cars, and at the same time that will be durable so that we will not be put to a constant expense for repair as well as to the bad service that does come out of a poorly paved street. That is a question that I say you gentlemen have all considered within your own jurisdiction, and it is a problem that there is probably only one right solution to, regardless of locality. I hope you gentlemen will take that into account and that you will be able to give us some advice.

Now, gentlemen, I am glad that you are here and I really wish that you could make your meetings here every year for a couple of years, because the educative character of these meetings to all public administrators as well as those who are immediately concerned and are taking part is so high that we will be glad to be your hosts just as long as you want. I know you have strings pulling upon you in other directions, and I know the

tendency is to go around from place to place; but I really do believe you could learn more and teach more here than you can in any two or three other places in this country put together, and I wish you would take into account whether you could come back here, if not next year, then in the next few years, for our benefit, I say rather than for yours. We think that this is a good central location for meeting and we think you could well take that thing into account for an early visit again.

PRESIDENT HARDEE: I am sure you have listened with much interest to Mayor Magee's address of welcome; I will call on Mr. Tillson of New York to respond on behalf of the Association.

MR. TILLSON: Mr. President, Mr. Mayor: In thanking you in behalf of the Association for Standardizing Paving Specifications for your very cordial welcome and greeting to our Association, I wish to say a few words somewhat explanatory of our coming here. A year ago this Association met in New Orleans, the Crescent and the Queen city of the South, a city that on account of its location and physical conditions, is one of peculiar interest to Engineers, a city whose business portion is, for the greater portion of the year, if not all the time, several feet below the Mississippi River, which flows along its side, a city where every drop of rain water that falls upon it except what is evaporated by the sun, has to be pumped from the city into the river. For these reasons, it was especially interesting, apart from its age, to all who attended that particular meeting. At the close of the meeting when the question of selecting the next place of meeting came up, there arose in one corner of the room a mild and modest appearing gentleman, and in the mellifluous tones which those of us who know our good friend O'Toole recognize so well, spoke to us with that oratory and wit that is characteristic of his race, telling us of the beauties, glories and wealth of Pittsburgh, telling us of the number and the beauty of its maidens; and when at the close of this speech he brought forth an invitation from the Mayor and the Chamber of Commerce to have our next meeting in this city, the recommendation was adopted unanimously. When yesterday morning, having a little spare time, I took a walk up through the hump district, to which the Mayor has just referred, and from there walked down to the Monongahela, and down its borders to the confluence of these two great rivers, the Allegheny and the Monongahela, and saw bridges which had been thrown across the Monongahela and others at the confluence which are now being constructed, and saw this extremely steep bank

on the opposite side of the river over which or up which cars were going at an incline of almost 45 degrees, other places where the cars were going through this bluff, I felt that Pittsburgh was a place that not only required the ability but the genius of the engineer to make it suitable to live in as well as a commercial district; and when, on my return to the hotel I walked up to the old block house built so many years ago for the defense of these early settlers in what must have been an extremely wild country, for their defense against the Indians, and saw in the tablet in the wall the time that it was built and the number of times it had been visited by George Washington, I felt that it was a place almost sacred to Americans, and I was again glad we had come to Pittsburgh. In the afternoon when, by the courtesy of some of your good Pittsburgh people, it was my pleasure to take an automobile drive through the residence portion of the city, and saw a topography which can not be exceeded for roughness and steepness in any city of the country; saw how that had been built up both in style of architecture and magnitude of buildings by the wealth of this great city, and the wealth that has been accumulated here in so short a space of time, I felt that Pittsburgh not only was a great commercial center, but it was a city that possessed, and I think I can say it knowingly, the most beautiful suburbs of any city in the country, I was again surprised and again glad that we came to this city; and thinking over what must have been done during these past few years, I said to a friend of mine, a city official, "Sprague, do you think if we stayed here four days we could make a fortune?" And he said "Four days? No, I don't think you could." "Well," I said, "suppose we stayed a month." "Well, I rather think you could if you stayed a month." So at that time, Mr. Mayor, I almost made up my mind to stay in Pittsburgh, and I almost hesitate to relate this for fear that most all of our members, if they thought they could make their fortune in a month, would all remain here, but I want to get it to them as an encouraging word if they do wish to, that there is a good prospect in the future.

Now, Mr. Mayor, I want to thank you for the courtesies of the city, and to say that after having read the program of the social part, the entertaining part that has been proposed, I think when we leave this city we shall feel that we have been treated royally and that we have not only gained from a progressive engineering standpoint but that we have gained a great deal from a social standpoint.

PRESIDENT HARDEE: Gentlemen, Mayor Magee, of course, as is the case with mayors of all large and progressive cities such as Pittsburgh is, is a very active and busy man, and he therefore asks that we kindly excuse him, which I am sure the members of the Association will do.

The Mayor has expressed a desire to attend some of our business meetings; I think the most appropriate time would be during the discussion of our reports. We will be very glad indeed to have you, and I am sure all the members will be glad to discuss all matters, Mr. Mayor, with you, answer all questions and give you any information we have.

MR. TILLSON: In order to get formally at the business of the meeting I would make a motion that the President appoint a Committee on Credentials to consist of five members.

PRESIDENT HARDEE: It has been moved and seconded that the President be authorized and directed to appoint a Committee on Credentials. Any objections? The Chair hears none. It is so ordered. I appoint—

Mr. Sherrerd of Newark, Chairman.

Mr. Connell of Philadelphia.

Mr. Norton of Grand Rapids.

Mr. Schmidt of New York.

Mr. Hittell of Chicago.

In order to expedite the work of the Association, it is requested that the Committee on Credentials meet in any one of the committee rooms next to the Secretary's room immediately when we recess.

Gentlemen, the standing committees for this meeting have to be in a measure remodeled. The Chair will take pleasure in having members make known at the conclusion of this meeting what committees they would like to be put upon. I don't know that I can comply entirely with the requests, but I will endeavor to do so if they will indicate which committee they would like to serve on. Please make known your wishes to me immediately after we recess because the committees must be formed by two o'clock or shortly after.

We will now hear from Mr. Kingsley of Little Rock.

MR. KINGSLEY: I have submitted a report signed by Mr. Christ and myself. There was a committee of three appointed at our Dallas meeting representing the American Society of Municipal Improvements to be present at this meeting, but Mr. Craig will not be able to be here on account of having changed location from Omaha to Calgary, so the report is signed by two of us, and I have submitted this report to Mr. Hittell, which we would like to have referred to your committee on the same subject, Mr. Tillson being chairman.

MR. HITTELL: Reads:

Pittsburgh, Pa., February 24, 1913.

To the President and Members of the Association for
Standardizing Paving Specifications.

Gentlemen: At our meeting in Dallas during November, 1912, the question of amalgamation came up on the receipt of a communication from your Amalgamation Committee, with resolutions proposed by Mr. Lewis at New Orleans and adopted at the last session at New Orleans.

The resolution adopted by the American Society of Municipal Improvements extends an invitation to the Association for Standardizing Paving Specifications to unite with the American Society of Municipal Improvements and a committee of three was appointed at Dallas to meet with you to attempt to effect an amalgamation.

Therefore, we respectfully request that your organization adjourn at the close of its present session to meet at Wilmington, Delaware, in September and that it shall be agreed that all active members of the Association for Standardizing Paving Specifications shall immediately become members of the American Society of Municipal Improvements without payment of any dues for the current year.

It shall be further agreed that the members of the various standing committees of the Association for Standardizing Paving Specifications shall become members for the current year of the same or like committees of the American Society of Municipal Improvements.

Respectfully submitted,

E. A. KINGSLEY,

E. H. CHRIST,

Committee for the American Society of
Municipal Improvements.

PRESIDENT HARDEE: Gentlemen, you have heard the reading of the communication. What is the pleasure of the Association?

MR. TILLSON: I move that it be referred to the Committee on Amalgamation.

PRESIDENT HARDEE: It has been moved and seconded that it be referred to the Committee on Amalgamation. If no objection, it is so ordered.

On motion, duly seconded and carried, the meeting adjourned until
3:00 P. M.

AFTERNOON SESSION.

3:00 P. M.

PRESIDENT HARDEE: Gentlemen, the meeting will please come to order. Owing to the lateness of the hour and the fact that the hoped for express train has converted itself into a slow

freight, the President will not take up your time with the usual annual address any more than to say that I am somewhat disappointed at the attendance, but I believe that by tomorrow morning we will have a much larger membership present. I don't feel that the small attendance today is due in any measure to a lack of interest on the part of any of the cities who are members of this Association, but more likely to the fact that because of change of administrations the older men have been retired who were with us during the past conventions, and probably not a proper understanding on the part of their successors of the importance of this Association. I am still, however, in hope that many additional delegates will be with us this evening and tomorrow.

The first thing in order will be for the Secretary to make the announcements.

MR. HITTELL: Mr. President, at a meeting of the Executive Committee this morning, in accordance with Article II of the Articles of Organization, Messrs. T. F. McGilvray, Felix A. Norden, Edward H. Christ, E. A. Kingsley and F. N. Bingham were continued as members.

PRESIDENT HARDEE: That, gentlemen, is merely to carry out the Articles of Organization and comes as an announcement. The next order of business will be the report of the Committee on Credentials.

MR. HITTELL: Reads: Pittsburgh, Pa., Feb. 24, 1913.

To the President and Members of the Association for
Standardizing Paving Specifications.

Gentlemen: The Credentials Committee reports the following accredited delegates to the convention, in accordance with the Articles of Organization and the action at the meeting of the Executive Committee held this morning:

ABERDEEN, South Dakota.
No delegate.

ABERDEEN, Washington.
No delegate.

AKRON, Ohio.
JOSEPH A. GEHRES.....City Engineer

ARDMORE, Oklahoma.
No delegate.

BALTIMORE, Maryland.
*H. KENT McCAY.....City Engineer
*R. K. COMPTON.....Chairman Paving Commission
*H. K. FAUST.....Paving Engineer, Annex Commission
ROBERT M. COOKSEY....Principal Assistant Engineer, Paving
Commission

*Absent.

BOSTON, Massachusetts.

J. H. SULLIVAN.....Division Engineer Highways

BRIDGEPORT, Connecticut.

No delegate.

BUFFALO, New York.

CHAS. E. P. BABCOCK...First Assistant Engineer

J. A. VANDEWATER.....Assistant Engineer

CHARLESTON, West Virginia.

No delegate.

CHESTER, Pennsylvania.

No delegate.

CHICAGO, Illinois.

FELIX A. NORDEN.....Ex-Member Board of Local Improve-
ments.JOHN B. HITTELL.....Chief Engineer of Streets, Board of
Local Improvements.L. A. DUMOND.....Engineer Chicago Association of
CommerceLINN WHITE.....Chief Engineer South Park
Commissioners

COLUMBUS, Ohio.

HENRY MAETZEL.....City Engineer

DAVENPORT, Iowa.

No delegate.

DAYTON, Ohio.

GAYLORD C. CUMMIN...City Engineer

DES MOINES, Iowa.

No delegate.

DULUTH, Minnesota.

No delegate.

GRAND RAPIDS, Michigan.

CHARLES E. NORTON....Member Board Public Works

L. D. CUTCHEON.....Secretary and General Manager Board
Public Works

*L. H. STEVENS.....City Engineer

EDWARD H. CHRIST....Ex-Member Board Public Works

HARRISBURG, Pennsylvania.

No delegate.

INDIANAPOLIS, Indiana.

H. W. KLAUSMANN.....City Civil Engineer

CHAS. L. HUTCHINSON..Member Board Public Works

C. H. UNDERWOOD.....Engineering Chemist

*Absent.

- KALAMAZOO, Michigan.
 ANDREW J. LENDERINK...City Engineer
- KANSAS CITY, Missouri.
 No delegate.
- LITTLE ROCK, Arkansas.
 *HENRY LEVINSON.....Superintendent Public Works
 E. A. KINGSLEY.....County Highway Engineer
- LYNCHBURG, Virginia.
 H. L. SHANER.....City Engineer
- MEMPHIS, Tennessee.
 No delegate.
- MILWAUKEE, Wisconsin.
 No delegate.
- MINNEAPOLIS, Minnesota.
 ELLIS R. DUTTON.....Assistant City Engineer
- MOBILE, Alabama.
 No delegate.
- NEWARK, New Jersey.
 MORRIS R. SHERRER....Chief Engineer Board Street and Water
 Commissioners
 DR. CHAS. F. KRAEMER..Commissioner Streets and Water
- NEW HAVEN, Connecticut.
 No delegate.
- NEW ORLEANS, Louisiana.
 CAPT. W. J. HARDEE....City Engineer
- NEW YORK CITY, New York.
 NELSON P. LEWIS.....Chief Engineer Board Estimate and
 Apportionment
 OTTO H. KLEIN.....Director of the Standard Testing
 Laboratory
- BOROUGH OF THE BRONX:
 No delegate.
- BOROUGH OF BROOKLYN:
 GEORGE W. TILLSON....Consulting Engineer
 HERMAN H. SCHMIDT...Chief Engineer Bureau Highways
 *WM. H. BROADHURST...Chemist, Bureau of Highways
- BOROUGH OF MANHATTAN:
 *E. P. GOODRICH.....Consulting Engineer
 *H. W. DURHAM.....Chief Engineer Highways
 R. A. MACGREGOR.....Assistant Engineer, Bureau of High-
 ways.
 R. ERNEST BEATY.....General Inspector, Department of Public
 Works.
- BOROUGH OF RICHMOND:
 No delegate.
- BOROUGH OF QUEENS:
 J. H. WEINBERGER.....Engineer in Charge, Bureau of Highway
- *Absent.

NORFOLK, Virginia.

No delegate.

OMAHA, Nebraska.

No delegate.

PHILADELPHIA, Pennsylvania.

WM. H. CONNELL.....Chief of Bureau of Highways

W. PURVES TAYLOR.....Assistant Engineer Bureau Highways

PASCO, Washington.

No delegate.

PITTSBURGH, Pennsylvania.

JOS. G. ARMSTRONG.....Director Public Works

JOHN F. O'TOOLE.....Superintendent Bureau of Highways and
Sewers

JOS. H. RYAN.....Superintendent Asphalt Plant

GEORGE W. BURKE.....Superintendent Bureau of Parks

N. S. SPRAGUE.....Superintendent Bureau of Construction

C. M. REPERT.....Division Engineer Bureau of
Construction

T. M. REED.....Division Engineer Bureau of
Construction

M. S. EVANS.....Chief Chemist Bureau of Construction

C. O. DAUGHADAY.....Division Engineer Bureau Water

C. A. FINLEY.....Superintendent Bureau Water

PORTLAND, Oregon.

No delegate.

RACINE, Wisconsin.

No delegate.

ST. LOUIS, Missouri.

W. L. HEMPELMANN...Engineer in Charge of Bituminous
Roads

ST. PAUL, Minnesota.

No delegate.

SALISBURY, North Carolina.

JOHN E. RAMSAY.....Consulting Engineer

SALT LAKE CITY, Utah.

No delegate.

SOUTH OMAHA, Nebraska.

No delegate.

SPOKANE, Washington.

*F. N. BINGHAM.....

SYRACUSE, New York.

HENRY C. ALLEN.....City Engineer

*Absent.

TOLEDO, Ohio.

GEORGE W. TONSON.....Chief Engineer Department of Public
Service

WAUKEGAN, Illinois.

*J. J. DIETMEYER.....Commissioner of Streets and
Improvements

ASSOCIATE MEMBERS.

AMERICAN ASSOCIATION OF CREOSOTED WOOD PAVING
MANUFACTURERS.

F. M. BARNARD
H. S. LOUD
ALBERT STAMFORD

BARRETT MANUFACTURING COMPANY.

BURTON M. SMITH
S. R. CHURCH
F. C. HUTCHINSON
L. P. SIBLEY
P. P. SHARPLESS

F. J. LEWIS MANUFACTURING COMPANY.

F. J. LEWIS

GENERAL PETROLEUM COMPANY.

R. H. PARKER

INTERNATIONAL ASPHALT COMPANY.

No Delegate

NATIONAL PAVING BRICK MANUFACTURERS'
ASSOCIATION.

WILL P. BLAIR
C. J. DECKMAN
C. P. MAYER

STANDARD ASPHALT AND RUBBER COMPANY.

WILLIAM A. LEVERING
J. M. WOODRUFF
F. W. PATTERSON

STANDARD OIL COMPANY OF NEW JERSEY.

HERBERT SPENCER

*Absent.

FOURTH ANNUAL REPORT OF THE ASSOCIATION

STANDARD OIL COMPANY OF NEW YORK.

R. L. CHRISTIE
W. D. CRAVEN, JR.

THE AMERICAN ASPHALTUM AND RUBBER COMPANY.

EDGAR NICHOLS
H. B. PULLAR

THE BARBER ASPHALT PAVING COMPANY.

CLIFFORD RICHARDSON *FRANK P. CAUGHLIN
C. N. FORREST G. M. STEVENS

THE DUNN WIRE-CUT-LUG BRICK COMPANY.

FRANK B. DUNN

THE EQUITABLE ASPHALT MAINTENANCE COMPANY.

J. M. MOORE.

THE TEXAS COMPANY.

WILLIAM H. KERSHAW

UNITED GAS IMPROVEMENT COMPANY.

W. H. FULWEILER

UNION OIL COMPANY OF CALIFORNIA.

GEORGE W. LAMSON

UNIVERSAL PORTLAND CEMENT COMPANY.

W. S. WING
BLAINE S. SMITH
W. M. KINNEY

WARNER-QUINLAN ASPHALT COMPANY.

A. R. KNIGHT

WARREN BROTHERS COMPANY.

FRANK G. CUTTER	G. M. INGRAM
GEORGE E. TENNEY	F. H. SHERRERD
DONALD McNEIL	GUY G. BUDGE
M. G. LESLIE	W. A. HOGUE

YELLOW PINE MANUFACTURERS' ASSOCIATION.

GEORGE K. SMITH
H. L. COLLIER

Respectfully submitted,

MORRIS R. SHERRERD, Chairman.
W. H. CONNELL,
H. H. SCHMIDT,
CHARLES E. NORTON,
JOHN B. HITTELL,
Committee on Credentials.

*Absent.

MR. SHERRERD: Mr. President, the Committee on Credentials presents this report and moves its adoption.

PRESIDENT HARDEE: Moved and seconded that the report of the Committee on Credentials be adopted. Do I hear any objections? None. So ordered.

Now, gentlemen, the meeting is in order for the transaction of business. The Secretary will read a resolution that is offered by the Executive Committee.

MR. HITTELL: The Executive Committee unanimously reports and recommends to the Association the following changes in the Articles of Organization: Section 11, changing the words "two hundred" to "fifty," so the section will read as follows:

"Section 11. Each Associate Member, upon joining the Association, shall pay a membership fee of fifty (\$50.00) dollars. Associate Members who have already paid such sum into the treasury of the Association shall be exempt from paying any further membership fee."

By adding to Section 12 the words "and Associate Members," so as to read as follows:

"Section 12. For the purpose of carrying on the work of the Association, necessary funds shall be provided by assessment on the cities members and associate members in such sums as may be decided upon by the Association at annual meetings."

PRESIDENT HARDEE: Gentlemen, you have heard the resolution. What is your pleasure?

MR. TILLSON: I move it be approved, Mr. President.

PRESIDENT HARDEE: It is moved and seconded that the resolution offered by the Executive Committee be adopted. Are there any objections? The Chair hears none. It is so ordered (Laughter.) I might state that if any one objects he should not do so.

The Secretary will now read his annual report or statement. In the rush of things I have not had the time to appoint the usual Auditing Committee. After the reading of the report a motion will be in order for the appointment of an Auditing Committee by the Chair. If I have the opportunity while the committees are being read I will announce the committee before we adjourn. The Secretary will now read his report.

MR. HITTELL: Reads:

To the President and Members of the
Association for Standardizing
Paving Specifications.

Gentlemen: Since the date of the last report Portland, Ore., Kalamazoo, Mich., Davenport, Ia., Pasco, Wash., and the Universal Portland Cement Company have joined the Association.

The reasonable price at which the proceedings of the Association were issued and the wide publicity of the specifications, together with the rumors of a possible amalgamation with the American Society of Municipal Improvements, have seriously affected the efforts to increase the membership, which is now as follows:

First class.....26 cities
Second class20 cities
Associate members.....11

The proceedings have been sent to every state in the union save one, and to Hawaii, Canada and South Africa; a total of about 1,600 copies of the various editions.

The following statement shows the financial condition of the Association:

Balance on hand as per statement rendered January 3, 1912	\$2,283.87
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RECEIPTS.

Dues, 3 cities, at \$50.....	\$150.00	
Dues, 1 city, at \$25.....	25.00	
Dues, 1 associate member at \$200.....	200.00	
Sale of proceedings and interest.....	505.24	
		<u>880.24</u>
		\$3,164.11

DISBURSEMENTS.

Expenses Third Annual Meeting.....	\$612.95	
Assistant to Secretary, balance due 1911.....	105.00	
Expenditures of Committees:		
Brick	\$18.50	
Bonds and Guarantees.....	23.80	
Pres. George W. Tillson.....	4.75	
		<u>47.05</u>
Secretary's Honorarium	500.00	
Printing Proceedings	536.85	
Printing, supplies	59.23	
Postage	23.00	
Badges	22.50	
Expressage	34.75	
Miscellaneous and exchange.....	6.22	
Transportation for Miss Carr and Miss Chandler, Pittsburgh and return.....	46.50	
Miss Chandler and Miss Carr, balance on stenographic work	100.00	
N. S. Sprague, official delegate Good Roads Convention	37.05	
Hotel Grunewald, Miss Chandler and Miss Carr.....	67.75	
Assistant to Secretary, Jan. 1, 1912, to March 1, 1913.	360.00	
		<u>\$2,558.85</u>
Cash balance in the hands of the Treasurer February 22, 1913		\$605.26

All obligations of the Association have been met up to this date with the exception of any expenses which may have been incurred by the President or Chairmen of Committees, and this statement does not include an item of bills receivable of \$25 for proceedings.

I have prepared a statement in detail of all receipts and disbursements which will be submitted with this report for audit.

Respectfully submitted,

JOHN B. HITTELL,
Secretary-Treasurer.

PRESIDENT HARDEE: Mr. Sherrerd moves that the report be referred to an auditing committee of three to be appointed by the President. I can make the announcement now. Is there any objection to that motion? The Chair hears none. It is so ordered.

The Chair will announce the Committee. I make Mr. Sherrerd chairman, Mr. Tillson a member and Mr. Christ a member.

MR. HITTELL: Reads:

**ENGINEERS' SOCIETY
OF WESTERN PENNSYLVANIA**

Pittsburgh, Feb. 13, 1913.

Mr. John B. Hittell, Sec'y,
Association for Standardizing
Paving Specifications.

Dear Sir: We have been advised by Mr. N. S. Sprague, Supt. of the Bureau of Construction of the Department of Public Works of this City, a member of this Society, that the Association for Standardizing Paving Specifications will hold its Fourth Annual Convention in Pittsburgh, February 24th to 28th, inclusive.

The Board of Direction of the Society desires to extend a cordial invitation to your organization to hold their meetings in the Society rooms on the 25th floor of the Oliver Building. Our auditorium seats about 250 people, is exceptionally quiet, and is well equipped for such meetings, having a projecting lantern, reading desk, etc., etc.

Owing to the necessity of a change in the date of our regular monthly meeting, I regret to advise that the Society will be obliged to use the auditorium for its monthly meeting on Tuesday evening, February 25th, and consequently, we will be obliged to reserve the use of the hall on that night. At all other times during your

stay in Pittsburgh, the auditorium will be at your disposal for meetings, or for the purpose of holding special committee meetings, etc., etc.

Trusting that your convention will be a most successful one, I remain,

Yours very truly,

ELMER K. HILES,
Secretary.

Which had been acknowledged with the thanks of the Association by the Secretary.

Also: Telegram from Mr. George W. Craig and letter from Mr. F. N. Bingham, containing expressions of regret on account of not being able to attend the meeting.

Also: Communications from Chairman of Stone Block Committee and Chairman of Cement and Concrete Committee.

PRESIDENT HARDEE: If there are no objections these communications will be referred to the Chairmen of Committees.

Now gentlemen, it is usual, when we have these conclaves, to mix some pleasure with business; so following the usual practice our good friends in Pittsburgh have arranged a very interesting and I believe pleasant program of entertainment. If the Secretary will be kind enough to read the program, I think Mr. Sprague will want to say something about it.

MR. HITTELL: Reads:

The following program of entertainment has been arranged by the Chamber of Commerce for the members of the Association:

Monday evening, February 24th, 8:30 P. M. Informal reception in Assembly Room tendered to the delegates and ladies by the local committee.

Tuesday evening, February 25th. A theatre party will be given at the Grand Opera House (Vaudeville) for the delegates and ladies of the convention. (Informal.)

Wednesday evening, February 26th, 6:30 P. M. A banquet will be given to the delegates and ladies in the English Room of the Fort Pitt Hotel.

Thursday, February 27th. An invitation has been extended by the H. J. Heinz Company to inspect this great plant, known world-wide as the "Home of the 57 varieties." Luncheon will be served by the Heinz Company. Ladies are invited to attend.

Through the courtesy of Mr. R. L. O'Donnell, Gen. Supt. Pennsylvania Railroad, a special train has been provided and will leave the P. R. R. (Union) Station at 10:30 A. M. for the works.

After lunch the party will be taken by train to Aspinwall to inspect the city water filtration plant. Mr. C. A. Finley, Supt. Bureau of water, and Mr. C. F. Drake, Division Supt., will furnish competent guides for this purpose. The plant contains 56 acres of sand surface divided into beds of an acre each. There are three settling basins, capacity 120 million gallons; one filtered water reservoir, capacity 50 million gallons. The present daily capacity of the plant is 120 million gallons. A plant for the preliminary treatment of the water is being constructed, which will increase the capacity to 200 million gallons daily and economize operation. The total cost of the plant to date is \$7,000,000. The new Aspinwall Pumping Station is now in progress of construction at Aspinwall Station; approximate cost about \$900,000.

In the evening the Carnegie Museum and Institute of Technology will be visited. These magnificent institutions were built and dedicated to the City by Andrew Carnegie at the cost of about \$10,000,000. The museum contains industrial, geological, zoological, historical and art exhibits, and is one of the most complete and interesting institutions of its kind in the world.

The Institution of Technology is one of the most completely equipped technical schools in the country, and consists of trade schools, engineering, applied design and industrial and domestic sciences for girls. The buildings are located in the civic and educational center of the city. Plans are now being considered for additional buildings and a further development of the work and purpose of the institution.

Special street cars, provided through the courtesy of the Pittsburgh Railways Company, will leave the Fort Pitt Hotel at 7:30 P. M., returning at 10:30 P. M.

Friday, February 28th. In the forenoon special trolley cars will convey the delegates and guests to Mount Washington and Duquesne Heights, both of these points being of great historic interest on account of the many eventful and stirring incidents which occurred here, in the early days of the struggling colonies. From this summit a most magnificent view can be obtained of the city and its environment; just below, the Allegheny and Monongahela Rivers unite to form the Ohio River. Where these rivers unite formerly stood Fort Duquesne, occupied by the French, which was later occupied by the English and known as Fort Pitt. Standing today, near the site of this fort, is the Block House, built in 1764 and used as a fortification by General Boquet of the British Army. The banks of the rivers have been changed during the process of industrial development from their former natural condition and are now lined

with busy industries and mills, which present a view when seen in the night, aptly described by a noted author as "Hell with the Lid Off."

In the afternoon automobiles will leave the Fort Pitt Hotel at 2:00 o'clock for a sightseeing tour of the city. Opportunity will be given to view Highland and Schenley Parks, some of the recent city improvements, prominent buildings and many other features of scenic beauty and interest.

MR. SPRAGUE: I want to say to the members of this convention that the Pittsburgh Chamber of Commerce has kindly consented to arrange for this program of entertainment. This evening at 8:30 in this room there will be an informal reception to which we want all of the ladies in the party in attendance. We will have some of the Pittsburgh ladies here and also some of the members of the Chamber of Commerce whom we want you people from the different cities to meet and become acquainted with. On Tuesday evening, as has been announced by the Secretary, there is a theatre party, and on Wednesday evening the banquet. Of course it is necessary to make early arrangements for all of these different functions, and I would urge upon you that after this meeting adjourns you register in the headquarters of the Convention, Room 138, just adjoining, your intention of attending both the theatre party, and the banquet on Wednesday. There has been a book provided for this purpose, and I would like to be able to report to the Entertainment Committee of the Chamber of Commerce, tomorrow morning if possible, the number of members and associate members who will attend these functions. I would just add that this reception tonight is wholly informal, and also that there is no charge for any theatre tickets or banquet. Those entertainments are provided free for the members and associate members in attendance. I think, Mr. Chairman, that is all that is to be said at this time.

PRESIDENT HARDEE: Now, gentlemen, I ask the Secretary to read the Committee assignments, together with the room in which each will meet. These committees are not entirely complete, because we have advice from some delegates that they will be here this evening and they will be added to the committees. That, however, will not debar the committees from proceeding with their work this evening or tomorrow. In other words, they will proceed with the work as announced. The Chairmen of the Committees will be advised of any additions to their committees. Before announcing these committees, it has occurred to me that it might be better to give all

of this evening and all of tomorrow to the preparation of reports; we can then meet early Wednesday morning for consideration and adoption, which will put all reports before the Convention at the same time and give all of the delegates an opportunity to hear the reading and participate in the discussion of the reports. Unfortunately, at our previous meetings, it occurred that some of our committees were in committee rooms preparing their reports while other reports were before the Convention. I think the best results can be accomplished by a full attendance of members in the assembly room while the reports are being discussed, and I think we would be better satisfied when we leave here and more than likely make time in the end if we devote this evening and tomorrow, as the members of the committees will agree among themselves, to preparation of reports, and meet the first thing Wednesday morning for the consideration of the reports. It is for you gentlemen to decide what you want to do. I think it will be well to discuss the matter before the committees are announced to determine what the sentiment of the delegates is, and thereby fix a time for reconvening when we adjourn this evening.

QUESTION: Are these committees classified as permanent committees that you are going to announce?

PRESIDENT HARDEE: They will be the active committees at this meeting of the Association. The committees are not complete; that is, they are as complete as we are able to make them, but as delegates come in this evening or tomorrow morning they will be added to the committees, but as I have just said, when these committees are announced we will be glad if the Chairmen will get their committees together and get to work as soon as they can and not wait for any augmentation of the committees, but consider that the committee is complete so far as they are concerned and go ahead with their work. I would like to get some expression along the lines I have just mentioned of adjourning this evening to meet early Wednesday morning. I am afraid if we try to fix tomorrow for consideration of these reports it will occur that some of the committees will be in the committee rooms while other reports are being discussed.

MR. SPRAGUE: I want to remind you that this evening we have an informal reception, and therefore the committees could not meet this evening.

PRESIDENT HARDEE: That would probably be all the more reason why it might be well to devote all of tomorrow to committee work. That would leave all of tomorrow open, the in-

tention being that we will adjourn until Wednesday morning at whatever hour you fix for consideration and discussion and adoption of the report. As I get it from the Chairmen, most of whom have been active during this year, their reports and conclusions, beyond what suggestions may now be made to them, are so well in shape that I am satisfied in one day they can be completed so when we go into discussion we can all be present and participate in the discussion.

MR. KINGSLEY: I move, Mr. President, that the committees meet at 10 o'clock Tuesday morning; that all day Tuesday be given to committee work; and that the Association meet Wednesday morning at 10 o'clock.

PRESIDENT HARDEE: Now, gentlemen, he has put that very plainly and I think every one understands it. I believe it has several seconds, and the Chair hearing no objection, the motion is carried. Please be careful to note these committees. We will have copies in the Secretary's room to give the Chairman of each committee. The members can remember what committees they are assigned to as well as the room in which the committee will meet. I believe I have stated that as the arrivals come these committees will be augmented and the Chairmen notified of the new members. The Secretary will read the list of committees.

MR. HITTELL: Reads:

ASPHALT COMMITTEE.

GEORGE W. TONSON, Chairman.....
 OTTO H. KLEIN, Vice-Chairman.....
 L. D. CUTCHEON.....
 C. H. UNDERWOOD.....
 JOSEPH H. RYAN.....
 M. S. EVANS.....

BITUMINOUS CONCRETE COMMITTEE.

LINN WHITE, Chairman.....
 E. A. KINGSLEY, Vice-Chairman.....
 J. H. WEINBERGER.....
 N. S. SPRAGUE.....
 W. H. CONNELL.....
 W. L. HEMPELMANN.....

BONDS AND GUARANTEES COMMITTEE.

HENRY C. ALLEN, Chairman.....
 CHARLES E. NORTON, Vice-Chairman.....
 C. L. HUTCHINSON.....
 DR. C. F. KRAEMER.....
 JOSEPH G. ARMSTRONG.....
 FELIX A. NORDEN.....

BRICK COMMITTEE.

EDWARD H. CHRIST, Chairman.....
 H. W. KLAUSMANN, Vice-Chairman.....
 C. M. REPERT.....
 J. A. VANDERWATER.....
 GAYLORD C. CUMMIN.....

CEMENT AND CONCRETE COMMITTEE.

CHARLES E. P. BABCOCK, Chairman.....
 T. M. REED, Vice-Chairman.....
 C. O. DAUGHADAY.....

MACADAM COMMITTEE.

H. H. SCHMIDT, Chairman.....
 GEORGE W. BURKE, Vice-Chairman.....
 H. L. SHANER.....
 R. A. MACGREGOR.....

STONE BLOCK COMMITTEE.

MORRIS R. SHERRERD, Chairman.....
 J. F. O'TOOLE, Vice-Chairman.....
 C. A. FINLEY.....
 J. E. RAMSAY.....

WOOD BLOCK COMMITTEE.

NELSON P. LEWIS, Chairman.....
 ELLIS R. DUTTON, Vice-Chairman.....
 L. A. DUMOND.....
 J. H. SULLIVAN.....
 GEORGE W. TILLSON.....
 R. ERNEST BEATY.....
 W. PURVES TAYLOR.....

Which assignments were on motion approved.

MR. TILLSON: The committee that was appointed to confer with the American Society of Municipal Improvements has its report ready, and I would suggest that it be presented and read now and then laid over for discussion later on when we are discussing other matters, so that every one will know what is in it and have a chance to think it over before voting on it.

Pittsburgh, Feb. 24, 1913.

To the President and Members of the
 Association for Standardizing
 Paving Specifications.

Gentlemen: Your Committee appointed by the President in accordance with a resolution adopted at the last meeting of the Association, to report on the advisability of the further continuance of this Associa-

tion or on the amalgamation with the American Society of Municipal Improvements, provided a suitable basis for such consolidation should be arranged, begs leave to report as follows:

Your Committee took up seriously the matter of amalgamation with the American Society, and after careful consideration and much correspondence the following communication was addressed to that Society:

"New York, October 28, 1912.

"The American Society of Municipal Improvements.

"Gentlemen: At the last meeting of the Association for Standardizing Paving Specifications, held in New Orleans in January, 1912, the undersigned were appointed a committee to consider the matter of the amalgamation of the above Association with the American Society of Municipal Improvements, provided a satisfactory scheme of consolidation could be worked out.

"This committee, after carefully considering the subject, has decided that it is advisable that the amalgamation should take place. Both of these organizations are made up of city officials and many officials belong to both organizations. It does not seem proper from any standpoint that two sets of city officials should be working along the same lines for the same objects, but producing in many cases different results. The Association for Standardizing Paving Specifications was organized for the one purpose only, while the American Society of Municipal Improvements, as its name suggests, deals with everything that relates to a city's welfare. It is, too, an older organization and has a larger membership; consequently it seems logical, if the two societies are merged, that the younger and smaller would join the older and larger.

"The committee therefore feels that it is ready to recommend to its Association that it merge with the American Society of Municipal Improvements on the following conditions:

"1. That, if such amalgamation do take place, the members of the Association shall be received into the American Society of Municipal Improvements and their dues fixed at \$3.00 per year as long as funds remain in the treasury of the Association to pay said dues; the Association itself to specify to the Society just what individuals shall be received under the above terms.

"2. Members of the Association who are at present members of the Society to be received upon the same basis as those who are not members.

"3. The Association has standing committees on the different kinds of pavements. Should the amalgamation take place, it will be understood that the members of these committees shall form a part of corresponding committees in the Society where such exist, and, where not, that they be independent committees; these joint committees shall report at the next meeting of the American Society of Municipal Improvements on standard specifications for the different pavements, and thereafter all committees shall be appointed as regular committees of the Society.

"Should the American Society of Municipal Improvements agree to the foregoing propositions, the undersigned committee is prepared to

recommend positive action upon the same at the next meeting of the Association for Standardizing Paving Specifications, which is to be held in February or March of 1913.

"The committee would ask, therefore, that the matter be taken up at the Dallas meeting of the Society and definitely acted upon so that final action can be taken by the Association at its Pittsburgh meeting."

The American Society of Municipal Improvements held its annual meeting in Dallas, Texas, in November last. After its meeting, the Active Chairman, hearing nothing officially from the convention as to action upon the foregoing communication, wrote the Secretary of the Society in regard to same, and in reply received the following as to the action of the Society:

"New York, December 21, 1912.

"To the Committee of the Association for Standardizing Paving Specifications Appointed to Consider Amalgamation with the American Society of Municipal Improvements.

"Gentlemen: Your honored communication addressed to the society was duly received and was considered at length by the American Society of Municipal Improvements at its Dallas convention on Wednesday, November 13th. The result of this discussion was the adoption of the following resolution:

"Resolved, That this society extend to the Association for Standardizing Paving Specifications a most cordial invitation to amalgamate with the American Society of Municipal Improvements, the only conditions being that the members of that Association who are already members of this society, remain members of the society as they are without any change in their status."

"In addition, the President was instructed to appoint a committee of three to include himself, which should attend the Pittsburgh meeting of your Association and convey to it our cordial invitation for amalgamation. This committee is composed of Messrs. E. A. Kingsley, George W. Craig and E. H. Christ.

"Respectfully,
(Signed) "A. PRESCOTT FOLWELL,
"Secretary."

At the present meeting of this Association a communication from the committee appointed at Dallas regarding amalgamation has been referred to this Committee which it does not seem necessary to repeat here, as it is already on record.

In submitting its communication your Committee felt that if this Association was merged and become a part of the other, which seemed better as the latter was the older society, the conditions expressed were reasonable and especially that its existing committees should have a voice in the first specifications that were to be issued after any merging, so that these specifications would have the weight of joint specifications.

Your Committee has given this communication from the American Society of Municipal Improvements careful consideration, and from conversations with the Society's committee feels that it is possible to bring

about an amalgamation that will be satisfactory and desirable to both societies. It seems that the principal objection to the acceptance of your Committee's report was the question of reduction of dues from Five Dollars to Three Dollars. Your Committee does not feel that this is a vital matter and is willing to waive it entirely. It does feel, however, as has been previously stated, that the amalgamating of the two organizations is of the utmost importance. It wishes therefore to reiterate all it has said in this matter so that the specifications may have the full weight of both societies. As nothing definite can be done until the next meeting of the American Society of Municipal Improvements, your Committee would recommend that the Executive Board of this Association be authorized to take up the matter at the Wilmington meeting of the American Society of Municipal Improvements with power to finally dispose of the matter, and in the event of satisfactory terms of amalgamation be agreed upon, that this Association immediately lose its identity and merge with the American Society of Municipal Improvements, but should no satisfactory terms be obtained, this Association shall meet again at such time and place as the Executive Committee may determine.

W. J. HARDEE,
Honorary Chairman.

GEO. W. TILLSON,
Active Chairman.

E. A. KINGSLEY.
C. E. P. BABCOCK.

Now, Mr. President, I move that that be laid on the table to be taken up at the business meeting at the end of the session.

PRESIDENT HARDEE: That is quite a lengthy communication and a very important one affecting the future of this association. And while listening to the reading of it, it has occurred to me that the members should carefully consider it and be in a position to carefully and intelligently vote on it when it is taken up later in the regular way by the Association.

You have heard the motion, gentlemen, and I know there are probably several seconds, and if there is no objection the motion is carried.

MR. LEWIS: I am going to ask the Committee on Wood Block Paving to meet in Room 140 immediately after the adjournment of this meeting. I would also say in Room 640 of this hotel there are on exhibition samples of wood for paving use which I am sure the members of the Committee will be glad to examine, and I would like to say to the representatives of the wood manufacturers who are present that we will endeavor to get up and have a look at them this afternoon.

PRESIDENT HARDEE: It is moved we adjourn until 10 o'clock Wednesday morning with the understanding the Committees will meet in their respective rooms tomorrow morning at 10 o'clock.

Wednesday, February 26th, 1913.

PRESIDENT HARDEE: Gentlemen, with no regret but much pleasure the meeting will now be called to order. The Secretary will please announce the delegates who have recorded since we adjourned day before yesterday.

MR. HITTELL:

Akron, Ohio.....	JOSEPH A. GEHRES
Baltimore, Md.....	R. M. COOKSEY
Dayton, Ohio.....	GAYLORD C. CUMMIN
Lynchburg, Va.....	H. L. SHANER
New York, N. Y.....	R. A. MACGREGOR
	R. ERNEST BEATY
Philadelphia, Pa.....	W. PURVES TAYLOR
St. Louis, Mo.....	WALTER L. HEMPELMANN
Salisbury, N. C.....	JOHN E. RAMSAY

ASSOCIATE MEMBERS.

Standard Asphalt and Rubber Co..	J. M. WOODRUFF
	F. W. PATTERSON
	W. H. LEVERING
The American Asphaltum and	H. B. PULLAR
Rubber Co.	EDGAR NICHOLS
Union Oil Company of California..	GEORGE W. LAMSON
Universal Portland Cement Co....	BLAINE S. SMITH
	W. S. WING
	W. M. KINNEY

PRESIDENT HARDEE: The Secretary announces a quorum present and the meeting is now in regular order for the transaction of business. What is your pleasure at this time?

MR. CHRIST: Mr. President, I would like to make a motion that the Association remain in session until four o'clock P. M., at which time it will adjourn to meet tomorrow morning at ten o'clock.

Motion seconded and carried.

PRESIDENT HARDEE: For the information of the gentleman and others who may be concerned, I will state that the hour of this banquet has been fixed for an unusual hour, 6:30, and I don't think we ought to be required to work up to that moment and not be given time to rest a little or relax; the idea is that we are satisfied we will have to have a session tomorrow; we cannot finish all the work this afternoon. If we go on until 4 o'clock with the work so far as we can go this afternoon, then we will recess, and that motion will properly be made a little later on.

MR. HITTELL: The buttonhole bouquets are the compliments of Mr. F. B. Dunn, of The Dunn Wire-Cut-Lug Brick Company. If the Association will so instruct, the Secretary will thank Mr. Dunn and furnish him with a copy of the proceedings.

PRESIDENT HARDEE: I presume there is no objection and the Secretary will be so instructed.

MR. HITTELL: At the last meeting of the Executive Committee the application of the General Petroleum Company for Associate Membership was approved by every member, and therefore under the rules of the Association Mr. R. H. Parker is entitled to represent it on the floor.

PRESIDENT HARDEE: The Chair wishes to announce at this time that under the rules of the organization in the discussion of the committee reports, that while the Associate Members have no vote in the adoption of the reports, they do have authority to delegate one person to represent them in the discussion of each report, so you gentlemen will understand if there is any discussion on the reports only one representative of each Associate Membership will be permitted to engage in the debate on the report.

MR. TILLSON: Mr. President, I would like to bring up the question of this report that was made on the amalgamation and ask as to the advisability of discussing it now or waiting until we have disposed of the committee reports. Why I mention it at the present time is because I know a number of people who are deeply interested in the matter will be obliged to leave tonight, as it was the original intention to adjourn the business proceedings today. I would move that the matter be taken from the table and discussed at the present time, Mr. Chairman.

PRESIDENT HARDEE: You have heard the motion of Mr. Tillson of New York, that the report on the amalgamation of this Association with the American Society of Municipal Improvements be taken from the table and discussed and disposed of at this time. What is the pleasure of this meeting? Shall that be done?

It is so ordered. Now gentlemen, the matter is open for discussion. I believe it is the desire of Mr. Tillson that he be heard on the report of the Committee.

MR. TILLSON: Mr. President, I think there are a great many people here who were not here when the matter was brought up early in the meeting, and while I do not wish to read this entire report because it is quite lengthy, I can state briefly what it embodies. As most of you know at the last meeting of this Association, a committee was appointed to consider the matter of the continuance of the

Association, and also the matter of amalgamation with the American Society of Municipal Improvements provided suitable terms could be arranged. In accordance with that action the committee which was appointed communicated with the American Society of Municipal Improvements at their last meeting held in Dallas, Texas, and suggested amalgamation on the following grounds: that the dues of the members of this Association when they join the American Society of Municipal Improvements be put at three dollars as long as the money in the treasury of this Association would pay them; then go back to their regular dues which are five dollars. Also that the standing committees of this Association be members of the same committees of the American Society of Municipal Improvements at the meeting following amalgamation, so the committees of the two associations could make a combined report; after that the members of this Association to be considered the same as the other. This last recommendation that the committees act together jointly so that the specifications would be joint specifications of the two societies is, I think, absolutely important and a condition that should be insisted upon before any amalgamation whatever takes place; because amalgamation is amalgamation; it means the two acting together; it does not mean that the members of this society shall individually join the other society. This matter was taken up at the Dallas meeting and discussed at great length, and the following resolution—and I would like to say before I read that resolution that I did not hear anything from the American Society of Municipal Improvements, and do not know as I should, unless I had, as I did, addressed a communication to the Secretary asking what was done with it. The resolution reads as follows:

“Resolved, That this Society extend to the Association for Standardizing Paving Specifications a most cordial invitation to amalgamate with the American Society of Municipal Improvements, the only conditions being that the members of that Association who are already members of this Society remain members of the Society as they are without any change in their status.”

The Society appointed a committee consisting of Messrs. Kingsley, Craig and Christ, all of whom are members of this Association, Mr. Kingsley and Mr. Christ being present. Now it seems to me that this resolution passed by the American Society means absolutely nothing. The Society did not decline our proposition or say in its communication to us what was objectionable to it. The Committee asked the Society in the communication to take some definite action so that this

Association at this meeting could take definite action; but as it seemed to the Committee they did absolutely nothing, so that the recommendation of the Committee at the present time is as follows; I will just read the last part of it:

"Your Committee has given this communication from the American Society of Municipal Improvements careful consideration, and from conversations with the Society's committee, feels that it is possible to bring about an amalgamation that will be satisfactory and desirable to both societies. It seems that the principal objection to the acceptance of your Committee's report was the question of reduction of dues from Five Dollars to Three Dollars. Your Committee does not feel that this is a vital matter and is willing to waive it entirely. It does feel, however, as has been previously stated, that the amalgamation of the two organizations is of the utmost importance. It wishes therefore to reiterate all it has said in this matter so that the specifications may have the full weight of both societies. As nothing definite can be done until the next meeting of the American Society of Municipal Improvements, your Committee would recommend that the Executive Board of this Association be authorized to take up the matter at the Wilmington meeting of the American Society of Municipal Improvements with power to finally dispose of the matter, and in the event of satisfactory terms of amalgamation being agreed upon, that this Association immediately lose its identity and merge with the American Society of Municipal Improvements, but should no satisfactory terms be obtained, this Association shall meet again at such time and place as the Executive Committee may determine."

This Association had a communication from the Committee of the American Society of Municipal Improvements, to which I referred, and as it is short, I will read that:

"At our meeting in Dallas during November, 1912, the question of amalgamation came up on the receipt of a communication from your Amalgamation Committee, with resolutions proposed by Mr. Lewis at New Orleans and adopted at the last session at New Orleans. The resolution adopted by the American Society of Municipal Improvements extends an invitation to the Organization for Standardizing Paving Specifications to unite with the American Society of Municipal Improvements, and a committee of three was appointed at Dallas to meet with you to attempt to effect an amalgamation.

Therefore, we respectfully request that your organization adjourn at the close of its present session to meet at Wilmington, Delaware, in September, and that it

shall be agreed that all active members of the Association for Standardizing Paving Specifications shall immediately become members of the American Society of Municipal Improvements without payment of any dues for the current year.

It shall be further agreed that the members of the various standing committees of the Association for Standardizing Paving Specifications shall become members for the current year of the same or like committees of the American Society of Municipal Improvements."

That, as I understand, gentlemen, is the feeling of the committee of the American Society of Municipal Improvements, but I want to call your attention to this fact, that at the last meeting of the American Society of Municipal Improvements the Executive Committee of that society recommended the approval of the communication from this society and when it went to the open convention on the floor it was turned down. Personally I felt that it was wrong that two organizations in this country be working together for practically the same results, and if it were possible it would be better for them to get together. But while that feeling is as strong as ever, the action taken at the last meeting of the society, makes me feel a little lukewarm on the general subject of amalgamation. At the same time, it is a question of how the different cities that send delegates here will feel about continuing. It is a fact that the funds of this Association at the end of this meeting will be practically exhausted, or that there will be a deficit if the proceedings are printed. So it will be necessary, if this Association is continued, to take further action for the raising of funds. That, I think, gentlemen, puts the matter fairly before you so you know what the general conditions are.

MR. SHERRERD: Mr. President, for the purpose of getting the matter before the Association, I move the adoption of the Committee's recommendation, viz., that the Executive Committee of this Association be given power to negotiate at the Wilmington meeting of the American Society of Municipal Improvements, with a view of perfecting amalgamation with that Society, provided the conditions as stipulated in the report of the committee can be brought about.

Motion seconded.

MR. TILLSON: I want to call attention to the clause of the Committee's report, which reads "Should no satisfactory terms be obtained, this Association shall meet again at such time and place as the Executive Committee may determine." That is, it is a tentative proposition. If we amalgamate

with the American Society, of course we have no meeting; if we do not amalgamate and the Committee report is adopted without prejudice, it would mean our next meeting would be subject to the call of the Executive Committee. I think that should be thoroughly understood.

MR. LEWIS (in the Chair): Gentlemen, you have heard the motion.

MR. CONNELL: Mr. Chairman, I would like to ask for a point of information whether the American Society of Municipal Improvements carries with it a city membership.

MR. TILLSON: Mr. President, for the information of Mr. Connell I would say it does not. The American Society of Municipal Improvements was started on the plan that the cities were members and the delegates from the cities came in practically as we do now. That went along for a few years, when it was found impracticable to carry it; that is, the cities did not pay the dues and it was changed to an individual membership; so it has not now a city membership.

MR. CONNELL: I agree with the sentiments that Mr. Tillson has expressed concerning the two organizations working for the same end, but I think the principle on which this organization is founded is the sounder, that is, the city membership. I cannot see how any association composed of a membership of individuals from various parts of the country can cope with this situation in as satisfactory a manner as an association composed of cities, which makes it a business proposition for the cities, and for this reason I believe that amalgamation is undesirable if the American Society of Municipal Improvements continues as an association of individuals, and I would like to make a suggestion or an amendment to the motion, that this Association refer this matter to the Executive Committee, and meet again within two years or three years from this date, to receive the report of the Executive Committee, and further discuss the matter. I think that an amalgamation of this Association with the other, losing the city membership, is taking a step backward. The question of standardization is very important to all of the cities of the country, and all public works departments; not only the standardization of paving specifications but all specifications; and nothing very definite will ever be accomplished along this line unless the cities and public works departments make it their business to see that it is done. I believe a great many of the cities have sent delegates to the meetings of this Association, and I think it is an acknowledged fact that more has been done in the three years of its existence than was ever done before by any association composed of indi-

vidual memberships; and I understand that most of the delegates here are sent and their expenses paid by the cities for the purpose of standardizing paving specifications, while in the American Society of Municipal Improvements they go as individuals, depending on whether they have the time or are sufficiently interested in the particular annual meeting. I think the suggestion I have made would be a wiser way to take this matter up, and would therefore offer that amendment to Mr. Sherrerd's motion. I believe the two societies should get together but somewhat along the line I have suggested.

MR. LEWIS: Is the amendment seconded?

DELEGATE: Seconded.

MR. KINGSLEY: I agree with Mr. Connell, and yet I disagree with him. For instance, at the meeting in New York City two years ago I was a member of the famous noisy brick committee. I was also City Engineer of Little Rock. Mr. Campen was Assistant City Engineer of Omaha, and Mr. Cellarius was City Engineer of Dayton. Not one of us at this time is acting in such capacity. The City of Omaha is not represented today; the City of Little Rock is not represented except by myself, and I don't know whether Dayton is or not. By virtue of the action of this Society we have been continued as active members of the Society, having once represented some city. It seems to me that it is only a question of a short time until this Association will find itself in the same shape that the American Society of Municipal Improvements found itself, and we will have a great many of our members who are active members representing in a measure some municipality, at least municipal work, but not directly connected with a municipality as an official. So far as the representation in the American Society of Municipal Improvements is concerned, I think it depends largely on the man whether or not he induces his city to be represented by himself as a city. I know that Little Rock has always felt that she as a city was represented as a member of the American Society of Municipal Improvements by having my membership, personal though it be, in this Society. Our present City Engineer, Mr. Levinson, is a member of the older organization, and it seems to me that we can represent ourselves as cities or municipalities if it be our desire, and I believe that the two societies combined, amalgamated, working along the same lines and working together, can do far more good than the two societies not combined, working along the same lines but separately. Now, I presume most of you, during the last six or eight months or a year, have received a communication from me, and some of

you have received two communications from me. As President of the American Society of Municipal Improvements last year, and one of the members of Mr. Tillson's Committee on Amalgamation for this Association, I took it on myself to write each active member, and I believe also associate members, of both societies, and with the exception of my good friend, Mr. Lamson, on my left, there was not a communication received in reply that did not say, "I prefer that the two societies amalgamate." I received a great many replies from both societies. Of course a great many did not reply. And it seemed the sense, almost the unanimous sense of both societies, so far as I could hear, that the amalgamation of both societies be perfected. After the action on this resolution at the Dallas meeting, both Mr. Christ and myself took it on ourselves to talk with the majority of the members present at Dallas, and it seemed to be a sort of misunderstanding, a mix-up on this question of dues being reduced from five dollars to three dollars, that the resolution was finally passed and a committee of three was appointed after the resolution had been passed. It was appointed largely because we felt we had not finished the work, and we felt that some form of amalgamation could be gotten together in connection with the committee which had already been appointed. I must say, Mr. President, that I am heartily in favor of the adoption of the motion which has been made, not the amendment. I think it would be a mistake to adopt the amendment. I believe under Mr. Tillson's guidance, the plan has been laid down whereby we can amalgamate. We can get together, and I certainly hope the motion will prevail without the amendment.

MR. WHITE: It seems to me that not only is this one of the most important questions that has come before this meeting, perhaps a more important question that the adoption of any one specification. I think if our specifications can't stand criticism and don't win their way by merit, they will amount to but very little in the long run. There are other standard specifications, among which I will name the specification for Portland cement, which I believe is practically universally recognized, but which has never had any official backing such as a city membership or anything like that. It has won its way by reason of the fact that it did stand criticism. Now, I think, too, that the work that this Association has done has been a very great one. We can't cram these specifications down the throat of any one, but I do think we can see in nearly every specification that comes into the hands of nearly every one of us throughout the country from cities or towns the influence and ear marks of the work

done in this Association. But, as I said in the beginning, it is a practical question, or almost a question of practical politics. I don't believe that the obligation as a member of this Association sits very heavily on the official body of any of our cities and so long as we, as engineers and city officials, from our own standpoint can't influence the backing of our city government, that backing will be lacking, and if the spirit and earnestness and work of this Association can be carried into the older society, I see no reason in the world why they can't succeed better by an amalgamation than by trying to work separately along parallel lines. So I would wish to express myself, with those preliminary remarks, decidedly in favor of amalgamation.

MR. KINGSLEY: I would like to hear from Mr. Lewis.

MR. LEWIS: Inasmuch as you have been good enough to ask for an expression of opinion from the Chair—I am somewhat reluctant to give it in this capacity—I will state frankly my own judgment. It has been in favor of an amalgamation with the American Society of Municipal Improvements, and it seemed to me, having been in touch with the work of the Committee, that our Committee presented to that society a very fair proposition. I confess to some feeling, not only of disappointment but of chagrin, that it was not received in the spirit in which it seemed to have been offered. The question of dues, I think, is trivial. The question, however, of the recognition of the committees of this organization appears to have been entirely ignored in the reply from the American Society of Municipal Improvements. In my judgment the recognition of our committees, of the work which they have done is a *sine qua non* to any amalgamation which it is possible for us to consider, and unless that association at its next convention is prepared to recognize our committees as of equal standing with its own, I do not see how we can consistently consent to any merger. My opinion is that the amalgamation is desirable. I recognize the advantages of the official character of this organization, but as has already been stated to you, the American Society of Municipal Improvements started with the same official character, as you have heard, and many of us are familiar with the history of the organization; how the sustained interest of the cities as municipalities waned, how it died out, and how it resolved itself into an association of individuals engaged in municipal work. I fear that history will repeat itself with respect to our organization. I think I have made myself clear. In theory I believe in it. I do not believe in an acceptance of the terms, if they might be so called, of the American Society of

Municipal Improvements, which were nothing more nor less than a propaganda for expansion or increase of membership. Unless our committee to whom this matter has been referred and in whose hands it has been, secures a proper recognition of our working committees, I do not think we can consistently consider it.

MR. KINGSLEY: I would like to say to the Chairman, and to the Chairman of the Committee, I feel just like you do regarding the report of the Committee that went before our American Society of Municipal Improvements, and unless the committees of this society are recognized at Wilmington as members of the standing committees of the American Society of Municipal Improvements, I would certainly oppose any amalgamation.

MR. TILLSON: We have an important part of this Association Associate Members, and I would be very glad to have a free and full expression of their opinion as it is possible to have. There is another thing, in regard to the people who are opposed to amalgamation; I think we ought in some way to get an expression of opinion as to what their idea is of their respective cities if this Association could be continued. Could we hope for a continuance of the city's support.

MR. CONNELL: I would like to ask Mr. Tillson if the Committee considered suggesting to the American Society of Municipal Improvements a city membership similar to that of this organization, and following the suggestion of Mr. Tillson as to the idea of the cities continuing their interest in this Association, or a similar association, or an amalgamation of both, provided the other association had city membership, I think that there is very little doubt but what most of the largest cities would continue this membership.

MR. TILLSON: How about Philadelphia?

MR. CONNELL: I will say that Philadelphia will continue the membership. The principle of standardization is something in which we are all interested, and it is the city's business and not our business as individuals, and we can never carry it through as individuals. This Association has done considerable good work in that direction. If it amalgamates with an association of individuals the chances are that Philadelphia, for example, might not be represented at the next meeting. The point I wish to make is that I feel I would be sufficiently interested to attend as I have been on one of the permanent committees, but in the event of my severing my connection with the City of Philadelphia it might so happen that my successor would not attend the next meeting; whereas

if the membership were composed of cities as at present, he would be sent by the City of Philadelphia as a delegate to the next meeting, simply as a business proposition. Mr. Lewis, I understand, said he believed in the theory of this organization and spoke of the poor success you had some years ago in the American Society of Municipal Improvements with the city membership. It is an acknowledged fact, however, that since this time conditions have materially changed all over the country, and I think if this Association were taken more seriously and the next meeting postponed for a couple of years or the amalgamation taken up along the lines of city membership there would be no doubt about the cities realizing the improvements and continuing their membership. I also think that Mr. Tillson's suggestion as to the opinion of material manufacturers is very interesting.

MR. LEWIS: Gentlemen, you have heard the suggestion.

MR. TILLSON: In answer to Mr. Connell's question as to whether the Committee considered that point, I would say no, and as a member of that Committee I should not only hesitate but refuse to do it after the way they treated the communication which we did send. I have not the slightest idea that if we sent such a communication they would say, "Why, you are already wanting to run the whole situation, and instead of wanting to merge with us, you want us to come in with you." I would like to hear from some of the Associate Members, Mr. President.

MR. LEWIS: We would be glad to hear from the Associate Members, we want their advice, and we would like to hear from them as to which organization would be most worth while to them, an organization of this character of which cities are official members or an organization like the American Society of Municipal Improvements composed of individuals.

MR. TILLSON: I would suggest that the Secretary call the roll of the Associate Members and ask some one to speak for each of them.

MR. LEWIS: The Secretary will please act on this suggestion.

MR. HITTELL: The American Association of Creosote Wood Paving Manufacturers, Mr. Loud or Mr. Barnard.

(Apparently not in the room.)

Barrett Manufacturing Company, Mr. Sibley.

MR. SIBLEY: Mr. Chairman, representing an Associate Member, I believe that there is opportunity for this Association to do work of more real benefit to municipalities than can be

done by the American Society of Municipal Improvements as at present organized, or as it is likely to be organized. The principal difficulty in continuing this organization is, as has been shown by the results in the older organization, that membership by cities, the officials of which must appoint one or more men to represent the city at the meetings, has resulted in too great uncertainty as to who will attend each meeting to permit of satisfactory and effective committee work, but this difficulty can, I believe, be overcome. The decision as to whether the two associations shall amalgamate can hardly be considered in all of its phases at this meeting, and the matter should be left entirely with the Executive Committee with power to act. If I were to offer a suggestion it would be that when this meeting adjourns it adjourn subject to the call of the Executive Committee, but that the Executive Committee be instructed to meet on or before the date of the next meeting of the American Society of Municipal Improvements and that each of the Associate Members be invited to send one representative to meet with the Committee, and that the Committee should first endeavor to formulate a plan that will insure the continuation of this Association on a scale that will compel the more general recognition of reports that receive its approval, and that failing to devise a plan which will insure this result, the Committee is then directed to arrange the best possible terms for the amalgamation of this Association with the American Society of Municipal Improvements.

It seems to me that as at present organized there is not a large enough number of cities having membership to give the specifications the standing they should have; for instance, there is only one city in the six New England States represented at this meeting; only three cities from the State of New York, and only two from Pennsylvania. This is not a sufficient membership to warrant continuing the Association, but I believe it possible to devise a plan for membership that will warrant its continuation.

MR. BABCOCK: We have been together two or three years on the old proposition and I think some of the gentlemen who went up to Chicago remember pretty well what we tried to do, and some who belonged to the other organizations seemed to think that we were doing more than they did. I guess we did. We got our committees together and worked hard. Now, on the matter of amalgamation! I would like to go in with them—or I would like to have them come in with us. Of course there is the matter of individual dues; so far as that is concerned, I think many of our old members would be very glad to waive that objec-

tion. We have had committees working for about three years and I think their work amounts to something and ought not to be disregarded entirely. If they want to take us in and we want to join in with them, the matter of expense might be cut out, but I do believe that our old committees ought to have some kind of a footing if we get into their association. I feel that very strongly. I don't believe we want to lose very much in the way of our own standing if we join them, and if they let us in I believe our own committees ought to get in on the same ground and standing that their committees enjoy. Now there is no reason, of course, why the two organizations should be engaged on the same work, if we can get down to a little better system and co-ordination. I would be very glad personally to join their organization, but I do think this: If they want to take us in and eliminate the work we have done I don't want to join—if they want to take us in and take account of the work we have tried to do in our committees, I would be very glad to go in with them. Now I think that is about the proposition of our amalgamation. We do want some kind of recognition for the work we have done and if we can't get it on an equal basis with their committees I think we ought to stay out. I am a member of the committee which was appointed for amalgamation.

MR. LEWIS: Gentlemen, we would be very glad to have a further expression of opinion from the associate members. Is there any one here from the National Paving Brick Manufacturers' Association?

MR. CHRIST: I would say this that we had a letter from Mr. Blair in which he strongly advocates amalgamation.

MR. HITTELL: Have Mr. Decker and Mr. Mayer left?

MR. CHRIST: They have all gone, but as chairman of that committee I took up the matter with them and they are all in favor of it.

MR. HITTELL: Standard Asphalt and Rubber Company, Mr. Patterson or Mr. Woodruff.

No reply.

MR. HITTELL: The American Asphaltum and Rubber Company, Mr. Pullar or Mr. Nichols.

MR. CHRIST: Mr. Nichols has just left and Mr. Pullar is at luncheon; both recommended it to me.

MR. HITTELL: The Barber Asphalt Paving Company, Mr. Richardson.

MR. RICHARDSON: I shall speak, of course, for myself and what I say I shall advise The Barber Asphalt Paving Company to act upon and I have no doubt the company will do so. I believe in the maintenance of this association for the reason that it is a concentrated working organization. I belong to the American Society of Municipal Improvements and have attended its conventions. The methods of work there do not appeal to me as they do in this association. We meet here as engineers; we discuss the subject at length in committees, and as associate members are well received and listened to. At the last meeting of the American Society of Municipal Improvements nothing of that sort was done. Reports were read and adopted without discussion or hearing. They were open to discussion on the floor of the house, but that does not permit of as thorough work as in committees. For that reason I am strongly in favor of this association under any circumstances. Numbers do not make strength; in fact, they make for weakness. The concentration of this association is one of its strongest points and for that reason I am in favor of it.

MR. HITTELL: The Texas Company, Mr. Kershaw.

MR. KERSHAW: I agree perfectly with what Mr. Sibley and Mr. Richardson have said recommending that you refer this to your Executive Committee with the suggestion that rather than amalgamate they formulate some plan for carrying on this association. As I see it, the main question will be the financial part of it. I believe we have about a dozen associate members and there are other concerns that would be glad to come in. The cost to each one would be slight and, by dividing up the cost of running the whole organization among the associate members they could very easily carry it along, and I know would be very glad to do it. The specifications you have adopted here we find in practice to be of great value, for the simple reason that when they are presented to a city engineer he recognizes them as specifications not only of a large city, but a specification adopted by representatives of a series of large cities, and time and time again I have found, in working on the asphalt proposition, that a town changes politics, and if a new engineer comes in he may be a young engineer, inexperienced, or he may be an expert in some other line, filtration, bridge, sewers or something of that sort, and he is completely at sea; it is useless for us to attempt to have him adopt the specification that we offer because he would blacklist that at once. If we showed him the two specifications of the American Society, and of Municipal Improvements, and of this organization we will find nine times out of ten that his

specification will be a copy of this one or very nearly so, which indicates absolutely that they place a great deal of weight on these specifications.

MR. HITTELL: The Union Oil Company of California, Mr. Lamson.

MR. LAMSON: Mr. President and gentlemen, Mr. Kingsley referred to me as perhaps the only member of the other organization that did not reply very emphatically to his communication. My reply to him was that I enjoyed an associate membership in both organizations and that I would be pleased to leave the matter entirely to the committees of those organizations; whatever they did would be entirely satisfactory to me and the company I represent. However, I want to say very emphatically that I am very much in favor of this organization. I find, I believe, at least, that until this organization was organized and started in to work that the American Society had done very little for the interests which I represent. Perhaps I may be a little strong about it, but it appears to me that they are somewhat stealing your thunder and it occurred to me that perhaps they ought to amalgamate with this association instead of our amalgamating with them. That is the way I feel about it.

MR. HITTELL: The Universal Portland Cement Company.
Answer: Nothing to say.

MR. LEWIS: It seems to the Chair, who is subject to correction, that the consensus of opinion of the associate members, or of those present, is that this association should continue provided it can finance itself, and in the event that this is impracticable it should merge with the other society and continue its work as best it can. Now, does any one want to speak on the amendment offered by Mr. Connell?

MR. SHERRERD: In speaking on the amendment, I should like to see the amendment defeated because it seems to me that the original motion does practically what every speaker who has spoken wants to have done; it refers the matter to the Executive Committee with power to make the conditions under which amalgamation shall be considered and also to determine whether it shall be considered at all. There is one phase of the question that appeals to me and that is that this organization can at this meeting elect its officers for one year. This resolution will then leave to the Executive Committee this whole question and if any amendment should be made to this proposition as now being discussed, it seems to me it should be an amendment along the line that would call the Executive Committee together before they go to the Wilmington meeting and consider the feasibility, or go a little further than this resolution does. This resolution empowers them to con-

sider amalgamation, and from the expression today it might be advisable to have it considered before this convention adjourns the question of the feasibility of attempting amalgamation at all.

MR. CONNELL: Gentlemen, I think Mr. Sherrerd has not exactly put the amendment clearly. My amendment was that this association continue and hold its next meeting within two or three years. Now, Mr. Sherrerd said this matter has been placed in the hands of the Executive Committee and that seemed to satisfy the expression of opinion of a number of the speakers; but every one of those speakers suggests that the Executive Committee, although not in these words, be instructed to use every means in their power to continue this organization. I think if it were put in the hands of the Executive Committee with instructions to continue, if possible this association, and if that were impossible to formulate some plan of amalgamation with the other association, that it would probably come nearer to the views that have been expressed here. If I can put my motion in that language and change it, I would be perfectly willing to do so.

MR. LEWIS: Do you want to try?

MR. CONNELL: If it is perfectly proper and the gentleman who seconded the motion will agree, I would move that the Executive Committee be instructed to formulate plans for continuing this association and holding the next meeting in two years; time and place to be decided by the Executive Committee. In the event of the Executive Committee failing to formulate plans to continue this organization, they shall then be instructed to form some plan of co-operation with the American Society of Municipal Improvements. Is that satisfactory to the second?

MR. BABCOCK: I want to say, Mr. Chairman, along that line, I think the committee who tried to effect the proposition of amalgamation have done about all they can, and the only thing to stand out upon is on the recognition by the other society. If you want to amalgamate we could do it in about fifteen minutes, provided the society would yield to our proposition; if we can't meet them or they can't meet us, I don't see why we should not go right along and finish our work.

MR. LEWIS: The motion of Mr. Sherrerd was that the report of our committee be approved and that the action recommended in the report be taken, namely, that the Executive Committee be authorized to take up the matter of amalgamation at the Wilmington convention and, in the event of satisfactory terms being agreed upon, the association lose its identity, and that amalgamation be perfected. In

other words, it left it to the Executive Committee with power to act. Mr. Connell moved an amendment to the effect that this matter be referred to the Executive Committee, that the Executive Committee attend the Wilmington convention and report the result to this association at a meeting to be held in two or three years. Mr. Connell has offered now a substitute for the original resolution, which has not yet been seconded. The question before the house is the amendment to the original report.

MR. BEATY: I accept the amendment as made by Mr. Connell.

MR. LEWIS: The Chair declares it is not an amendment, it is a substitute motion.

MR. TILLSON: As I understand it, the committee's report is before the meeting for some action.

MR. LEWIS: Yes, sir.

MR. TILLSON: I was wondering if Mr. Connell's motion would be in order then at all, unless it were something like this: That the report be received, referred to the Executive Committee and the Executive Committee asked or requested to do certain things. You have to do something with the report.

MR. LEWIS: I think Mr. Connell's motion, by way of a substitute, is defective in this respect: that it does not dispose of the report of the committee.

MR. TILLSON: We have a motion and an amendment.

MR. TAYLOR: It seems to me the thing to do would be to refer the report back to the committee with instructions to report again to this association at another meeting to be held two years from this date. I don't believe that the Executive Committee, inasmuch as we trust them, should have power to act on a thing as important as this and I suggest that the report be referred back to the committee to report at a meeting of this organization.

MR. LEWIS: I take it that that is identical with Mr. Connell's amendment. If he will stick to the original amendment—

MR. CONNELL: I will stick to the original amendment and withdraw the substitute.

MR. LEWIS: The substitute is withdrawn; the amendment is before you. Are you ready for a vote?

MR. TILLSON: I don't exactly understand how it will be left if this motion is carried.

MR. LEWIS: Mr. Connell has moved an amendment to Mr. Sherrerd's resolution. Mr. Sherrerd's resolution was that the report be adopted in all its features. Under that report our Executive Committee would go to the Wilmington convention, and would take up with the American Society of Municipal Improvements the question of amalgamation; if terms satisfactory to the Executive Committee were agreed upon amalgamation would there and then automatically take place. The substitute is that this report be referred to the Executive Committee, that the Executive Committee attend the Wilmington convention and report back to a subsequent meeting of this association the result of its negotiations.

MR. NORTON: I hope that this amendment will not prevail. I notice here that the manufacturers are strictly in accordance with continuing this association, but I represent a city which has always been represented in this meeting. We have always come here represented. I notice that this association is not able to hold the cities that have been represented heretofore. I don't believe that this association will hold the cities in line and I am strictly against continuing this organization. I think we should join in with the other society. The work of this organization is practically done and when you take out the cities, take out the men who are here represented and affiliated with the other organization, you won't have very much left. My idea is that we should go in with the other organization, and do it now. The original report says to wind up our business here.

MR. TILLSON: There is one thing here, if this idea of Mr. Connell's motion should prevail. I don't like the wording that the Executive Committee be instructed to go to Wilmington. If it is going to be left with the Executive Committee to take it up at Wilmington they can meet together and send one man.

MR. CONNELL: It was only to report back; you don't have to go to Wilmington.

MR. LEWIS: You have to negotiate with the other organization.

PRESIDENT HARDEE: If you would permit a suggestion, I suggest that the gentlemen withdraw all previous motions and amendments thereto and submit a new motion so that the record can be kept clear. It seems to me in the limited time I have been in the room so many motions and amendments are confusing.

MR. LEWIS: The Chair will proceed along parliamentary lines.

MR. O'TOOLE: I would like to say one word regarding the amendment I feel like most of the gentlemen present, that there ought to be centralization in the standardizing of specifications; some one should speak with authority. Inasmuch as this question has been up, I believe, in the last two meetings of this association, the consensus of opinion was that it would be advantageous to both bodies to unite and I feel that it has been canvassed enough not to let this matter go back again for another year or two years and leave us in a state of suspense. I believe that the vital principle at issue between both organizations today is probably the one of representation; whether or not the subjects to be discussed in convention shall be presented by individuals or with the seal of authority of the municipality on the delegates. The parties who are the beneficiaries of the resultant deliberations of this body are the cities or municipalities; that being true, the form of city representation is the best form to accomplish the aims and objects of any organization similar to this or the American Society of Municipal Improvements. I feel that it is the older organization and has covered the field thoroughly in most subjects and I believe that the cities and municipalities would be benefited greatly by an amalgamation; still, I feel that the basic principle of perpetuation of similar organizations to this is the basis upon which the membership stands and I believe, therefore, that there is not a council in any municipality in these United States today, if this subject were placed before them as a business proposition, that will not become members of this association. I believe that; I don't know. Some of the old members have probably canvassed the field and can speak from experience, but I agree with the former speaker that times have changed and I believe, further, that just as long as the changes that arise from politics and other conditions in our states prevent the individual from attending the convention, just so long does the organization lose its influence. For that reason I feel that now if we are not satisfied as to the standing of our present organization we should either enlarge its scope or instruct our Executive Committee to go to the convention of the American Society of Municipal Improvements and tell them identically where we stand and what we want. It is not proper to bind Mr. Tillson, who I know has given this matter great thought and study and whose opinions I have great respect for, and I am willing to vote on the proposition to give him authority to use his judgment. At the same time I don't think it wise to put this proposition back two or three years and place this organization in a precarious condition. For that reason I don't believe any amendment should be passed on unless it is the instruction of this body.

MR. BEATY: I would like to add a word to what has been said. The Society of Municipal Improvements covers a broad field of engineering activity, such as pavements, sewers, water-works, sewerage disposal, street lighting, street cleaning, etc. This Association devotes all of its time and energy to but one of the broad subjects mentioned, and to the accomplishment of but one object: the "Standardizing of Paving Specifications." Another consideration is that here we meet a number of specialists such as contractors, dealers and manufacturers of materials, who supply not the least valuable part of the data considered in formulating specifications. For the reasons given I think that in preserving the individuality of this Association conditions immeasurably favor our securing the best practicable specifications. Consider the question of membership; this Association is relatively few in numbers, but including as it does men who are especially well informed on paving matters, its relatively few numbers are an advantage. Today the American Society of Civil Engineers has a membership of over six thousand, and while it covers in detail by committees the various engineering subjects, its tendency is to become rather unwieldy in the general discussions which every one appreciates is often the most valuable part of the proceedings. I presume that the American Society of Municipal Improvements has about twenty-three hundred members.

Remark: No, only about 300.

MR. BEATY: That does not affect the situation as I have presented it except in so far as relative numbers are concerned. In the matter of city representation I would say that conditions are changing rapidly. During the past two years an increasing number of cities have adopted the commission form of government, which to a large extent has taken the administration of city affairs out of politics. Under these conditions the cities will more readily lend their assistance to carrying forward the work of this organization. They are showing their awakened interest in paving matters, in many instances by paying the expenses of engineers abroad to study the paving situation. It would seem that a large part of this information could be secured by intelligent co-operation with the members of this association. The cities have much to gain from these conferences, but unless their interest is sufficient to impel them to send their engineers to these meetings very little good will be accomplished as far as they are individually concerned by the results of these deliberations. In conclusion, I would urge that the interests of the manufacturers and dealers are conserved by the perpetuation of this organization—I refer to their opportunity of always having a hearing before the adoption

of any radical changes in specifications. The American Society of Engineering Contractors shows conclusively by its growth the fact that much is gained by co-operation between men who carry on the work and the men who draw the specifications.

MR. TILLSON: I understand that this question—is it a motion on the amendment?

MR. LEWIS: It means we will vote on the amendment. Gentlemen, the Secretary will call the roll on the amendment by cities. I suggest that you get together as closely as you can and save time on the city vote. Each city votes as a unit.

MR. HITTELL: Roll call:

Akron, Ohio—Votes “No;” does not know what he is voting for.

Baltimore, Md.—No response.

Boston, Mass.—No response.

Buffalo, N. Y.—No.

Chicago, Ill.—No.

Columbus, Ohio—No response.

Dayton, Ohio—No.

Grand Rapids, Mich.—No.

Indianapolis, Ind.—No.

Kalamazoo, Mich.—No.

Little Rock, Ark.—No.

Lynchburg, Va.—No.

Minneapolis, Minn.—No.

Newark, N. J.—No.

New Orleans, La.—No.

New York, N. Y.—3/7 Yes and 4/7 No.

Philadelphia, Pa.—Yes.

Pittsburgh, Pa.—No.

St. Louis, Mo.—No.

Salisbury, N. C.—No.

Syracuse, N. Y.—No.

Toledo, Ohio—No.

MR. LEWIS: Gentlemen, the amendment has been defeated. All vote “No” on the amendment except Philadelphia and 3/7 of New York. The vote now is on the resolution offered by Mr. Sherrerd which approves the report of the Committee.

The Secretary will please call the roll by cities on the original resolution.

MR. TILLSON: I would like to inquire, Mr. President, if you think the question is fairly understood by the house. The matter was referred to the Executive Committee with power to effect an amalgamation at Wilmington if that can be done on satisfactory terms; if they can't, then the time and place of the meeting of this Association be left to the Executive Committee.

MR. LEWIS: It is perfectly understood; the Secretary will call the roll by cities.

MR. HITTELL: Roll call:

Akron, Ohio—Yes.
Baltimore, Md.—No response.
Boston, Mass.—No response.
Buffalo, N. Y.—Yes.
Chicago, Ill.—Yes.
Columbus, Ohio—No response.
Dayton, Ohio—No response.
Grand Rapids, Mich.—Yes.
Indianapolis, Ind.—Yes.
Kalamazoo, Mich.—Yes.
Little Rock, Ark.—Yes.
Lynchburg, Va.—Yes.
Minneapolis, Minn.—Yes.
Newark, N. J.—Yes.
New Orleans, La.—Yes.
New York City, N. Y.—2/7 Yes and 5/7 No.
Philadelphia, Pa.—No.
Pittsburgh, Pa.—Yes.
St. Louis, Mo.—Yes.
Salisbury, N. C.—Yes.
Syracuse, N. Y.—Yes.
Toledo, Ohio—Yes.

MR. LEWIS: Gentlemen, the resolution has been adopted, there being but 1 5/7 votes in the negative, the rest being affirmative.
Captain, I surrender to you.

MR. SHERRERD: As we seem to be taking up business matters in the advance of the reports of the committees, I have a matter which I would like to bring up and wish to present a resolution which would recommend the appointment of a committee to formulate legislation to protect from the destructive effect of excessively heavy loads these pavements for which we are preparing specifications. Mr. President, with your permission I will present this resolution and move its adoption:

“Resolved, That the President of this Association for Standardizing Paving Specifications appoint a committee of three to formulate and suggest to the several highway associations and similar organizations of the country a proposed form of legislation to regulate and control the use of the public roads and highways by the automobile bus and truck and other self-propelled truck and traction engines, to the end that the good roads of the country may be protected from the present destructive tendency of their use by excessively wide, large and heavily loaded vehicles of the class herein described, and for the further purpose of obtaining a general expression

of opinion on this subject which may result in uniform legislation throughout the several states to regulate the same."

In offering this resolution I would say that legislation covering this regulation of auto trucks, etc., is now under consideration in Massachusetts and New Jersey, and a similar resolution was adopted at the Atlantic City Good Roads Convention.

PRESIDENT HARDEE: Gentlemen, you have heard the resolution read and the remarks offered. I think that this resolution is one that appeals to every one connected with this Association, and I hope that the Association will adopt it. All those in favor of the adoption of the resolution will signify by saying "Aye." Contrary "No." The "Ayes" have it and the resolution is adopted. It is understood, Mr. Sherrerd, that the incoming President will take care of the matter during the year.*

MR. TILLSON: I would move that the Chair appoint a committee of five on nomination of officers for the coming year. Motion seconded and carried.

PRESIDENT HARDEE: The Chair appoints Mr. Tillson as chairman, Mr. Allen of Syracuse, Mr. Hempelmann of St. Louis, Mr. Sherrerd of Newark, Mr. Dutton of Minneapolis.

It is hoped, gentlemen, that this committee will make a report tomorrow morning. We have already been delayed with our proceedings much beyond what we had anticipated. We find it will be necessary to hold a session tomorrow morning, and we hope that when we will meet tomorrow morning at the hour fixed by the resolution adopted in the early part of this meeting, we will be here at ten o'clock and not at one o'clock as we were today. The delay in getting in the committee reports and the consideration of them has necessitated a change in the entertainment program. We had been kindly invited by the Heinz people to make a trip to their very interesting plant tomorrow morning. That will have to be called off, so we will meet as per the resolution at ten o'clock for the continuation of such business as remains unattended to when we adjourn at four o'clock today. We do hope, however, to be able to make a trip to the filtration plant, which I am told is a very interesting matter. The committee of the Chamber of Commerce, with whom I have been in conference since we started this meeting, are endeavoring to arrange now, because we have to go there by special train to leave somewhere between 2:30 and 3:00 tomorrow afternoon,

*On May 3, President Sprague appointed on this committee Messrs. Sherrerd, Christ and Tonson; Mr. Sherrerd to be the Chairman

the exact time of leaving will be announced at tomorrow morning's meeting, and while I am making this announcement, I would like to say that for the banquet, every one is requested to be down in the rotunda as near 6:30 as possible. There will be no admission cards; the membership badges of the association will be your recognition, and I ask that you kindly be there as promptly as you can. What is the pleasure of the association at this time?

MR. WHITE: I move we proceed with the regular committee reports, Mr. Chairman.

PRESIDENT HARDEE: It is moved that we proceed to the consideration and adoption of the regular committee reports. Any objection? The Chair hears none. It is so ruled.

Gentlemen, in order to expedite the work of the meeting the old reports have been used so far as they could be and merely the changes indicated. I take it all of you who are particularly interested in these matters have a copy of the last report with you and will follow so as to know what changes are being made.

I will call for the report of the Committee on Asphalt, Mr. Tonson, chairman.

MR. TONSON: (Reads report.)

The committee thought, for the information of engineers generally, it would be well to insert these methods referred to in the specifications. Other points in the specifications have not been interfered with. As to the guarantee we thought that the Committee on Bonds and Guarantees might take that up, but we did not have time to go into it thoroughly and we left it as it was. I move the adoption of the report.

MR. TILLSON: In regard to that I would like to say that while most of the modifications in the specifications that have been read appeal to me as proper, still this question of the methods of analysis which has been read—no one in hearing it read would be able to take it all in, and it is very important and one that affects every city that is laying asphalt, and as far as that portion of the report is concerned, I would move that it be printed and laid over for consideration at the next meeting.

Motion seconded.

PRESIDENT HARDEE: Gentlemen, the report has been read and the adoption moved by its chairman, Mr. Tonson, properly seconded, and is now open for discussion. Mr. Tillson, do I understand that you move as an amendment—

MR. TILLSON: My amendment is to adopt the report except as it refers to the method of testing and that that portion be printed and laid over for our next meeting.

Motion seconded.

PRESIDENT HARDEE: That would have to be a substitute motion. Mr. Tillson moves that Mr. Tonson's motion to adopt the report be amended so as to provide for the adoption of the report except as to the tests, and that that portion of the report not be adopted at this time but be laid over for consideration at the next meeting and printed in the proceedings but not as a part of the adopted report. Is there any further discussion of the matter?

MR. KLEIN: Simply as explanation I want to state that these methods of analysis have been in use for quite some time at the Standard Testing Laboratory of the City of New York. All of the chemists present here, I believe, are thoroughly acquainted with them. I have no objection to Mr. Tillson's motion whatsoever but simply for explanation I want to say that there is nothing strange about them. They are the best methods for the various tests.

MR. TONSON: I want to say in reply to that, that the committee put that forward as a sort of addition to the specifications, thinking it desirable. We had three chemists on the committee and they all agreed to have this added to the specifications.

MR. EVANS: In regard to the methods of testing that are appended to the committee's reports, those were added for this reason, that nearly every specification that you see, this one not excepted, states that the test shall be made in accordance with the official methods on file in the City Engineer's office. Now I would like for the City Engineers present who have official methods on file for the analyst's information, or for the information of all concerned when material has been rejected to hold up their hands. One, two, three, four. That is encouraging as I see a few of the cities represented really have methods on file, which is not always the case. This was simply recommended for the reason that they would be present and you could locate them and know what they were. They are possibly not the best but I think the chemists present, if they had the time to look them over, would say that they are the ones that have been used and found to be good. I have no objection to Mr. Tillson's motion, as it was the idea of the committee to get these methods before the association for its consideration.

MR. TILLSON: I think, Mr. President, it is certainly the proper thing, and it is certainly important and it will have all the weight of being the sense of the chemists of the meeting if it goes in in this way. It only gives the chance for the final adoption after it has had the consideration of the chemists of the different departments.

PRESIDENT HARDEE: The Chair would suggest that as the matter is important and in order to get it in the official record properly, the report might be changed so as to recommend the test for the time being, or tentatively, or how will we get it into the record at all?

MR. TILLSON: The report goes in just as it is and the action on it, if this amendment carries, would be that the report is adopted with the exception of the methods of testing and that they be printed and laid over.

PRESIDENT HARDEE: Then our official proceedings would not carry with it any suggestions as to test.

MR. TILLSON: No.

PRESIDENT HARDEE: All right. I think you all understand the motion and amendment. All those in favor of the adoption of the amendment signify it by saying "Aye"; contrary "No." The amendment is carried. Now we revert to the original motion, the adoption of the report, with the elimination of the test portion. That question is before you.

MR. HITTELL: If I made the notes properly, on page 140, paragraph C, the last sentence, the report changes it to read as follows: "If the asphaltic cement as used in the paving mixture varies from 50 penetration, an increase of 2 centimeters in ductility will be required for each 5 points in penetration." Is that correct? It could be 3; the way I have it the correction seems to fix it at 2 rigidly.

MR. TONSON: The words "at least" it was thought advisable to cross out. It was thought that an increase of 2 centimeters would be proper but it seems to make it mandatory there.

MR. KERSHAW: I would like to speak on that one point; I noticed that at the time. I know that some of the asphalt people are going to have trouble on that very thing where the town is not equipped with its own laboratory and sends the sample to a testing laboratory that is not familiar with asphalt paving. A chemist is apt to interpret that as being literally 2 centimeters, and if it goes over 2 centimeters he will report it back as being over the requirements in the specifications, and thus throw the responsibility back on the engineer who would have to act contrary to his own chemist's report. It seems to me the words "at least" are necessary and I think it would be a great help if we would leave that in.

MR. TONSON: The Committee on Asphalt is willing to make the report read "not less than 2 centimeters" or leave it the way it is printed.

MR. KERSHAW: As there is a motion before the house to accept the committee's report as rendered, I think that someone who has the privilege of the floor should make a motion to amend their report adding the clause "not less than 2 centimeters."

PRESIDENT HARDEE: I understand you are proposing to make some little change.

MR. TONSON: I move that the words "at least" stay in.

PRESIDENT HARDEE: The proposition is that the words "at least" be left in as in the original report and not stricken out. It has always been the custom that the committee on the floor could change the report and I understand that it is the desire of the committee to change its report.

MR. TONSON: Yes, that is the desire of the committee.

PRESIDENT HARDEE: The motion before the house is the adoption of the report as read and as amended.

MR. KINNEY: In this particular specification no mention is made of a concrete foundation. As practically all asphalt pavements are laid on a concrete base and as all of your other specifications where concrete is adaptable state that the concrete base shall be laid in accordance with the specifications for concrete foundations recommended by the Committee on Cement and Concrete, it would seem that such a paragraph should be added to complete the specification. I therefore respectfully suggest such an addition.

PRESIDENT HARDEE: It is the recollection of the Chair that on all pavements the Committee on Concrete fixed a proportion of aggregate, sand and cement, for all pavements, leaving the thickness for the various pavements to depend on local conditions. Am I right, gentlemen?

ANSWER: That is right.

PRESIDENT HARDEE: I don't think the matter of foundation was specifically taken up in any one of the particular committee reports except where they felt it was necessary in the matter of thickness. At the New Orleans meeting I

think there was considerable discussion on that subject. It was my recollection the Committee on Concrete dealt with the mixture and left the matter of thickness to the committees on the various pavements for recommendation.

MR. KINNEY: There is nothing in this specification to indicate that a concrete foundation should be used. All other specifications except macadam and bituminous concrete state that the concrete foundation shall be laid in accordance with the Cement and Concrete Committee's recommendations. The omission in this specification might lead to the belief that no such foundation is required.

MR. WHITE: I just want to call the gentleman's attention, and the Chair's attention to the fact that in the report on Bituminous Concrete Paving Specifications the concrete foundation is referred to.

MR. TILLSON: Is the question of the adoption of the report before the house?

PRESIDENT HARDEE: Yes, sir, and the discussion.

MR. TILLSON: I would like to say that after that has been acted upon I am prepared to make a motion that it is the sense of this meeting that where a concrete foundation is used in connection with any of these pavements, that a concrete foundation in accordance with the specifications made by our committee be used.

PRESIDENT HARDEE: If agreeable to the committee, it might be well for it to say that it will add that clause to its report and not require this subsequent action by the association. Will that be agreeable?

MR. TILLSON: I think the other would be the simpler.

MR. TONSON: That will be perfectly agreeable to the committee. The committee is principally concerned in the wearing surface of asphalt pavements. It is presumed that no one will lay an asphalt pavement on a mud road. However, I think it is perhaps desirable to have it in, and the committee will be very glad to add that.

PRESIDENT HARDEE: It is understood then that the Committee on Asphalt will add to its report, which is now before you for adoption, the clause contained in the other specifications as to foundation.

All those in favor of the adoption of the Asphalt report as amended, will please signify by saying "Aye"; contrary "No." The report stands adopted as amended.

The following is the amended and adopted

REPORT OF THE COMMITTEE
ON
ASPHALT PAVING SPECIFICATIONS.

Pittsburgh, Pa., February 26, 1913.

To the President and Members of the
Association for Standardizing
Paving Specifications:

Your Committee on Asphalt Paving Specifications begs to submit for your consideration and approval the appended specifications.

Representatives of such producers and dealers as desired to appear before the Committee were heard and their suggestions given careful consideration.

Your Committee has attempted to make such changes only in the present specifications as was deemed necessary to make them conform to present conditions in the development of the asphalt paving industry and the available supply of materials.

All information available was carefully considered by the full Committee in arriving at conclusions.

Your Committee thought it advisable to add to these specifications a description of the methods of conducting tests therein provided for.

Your Committee tenders thanks to the several gentlemen who appeared before them for their valuable suggestions and advice.

SPECIFICATIONS FOR SHEET ASPHALT PAVEMENT.

The pavement shall consist of a concrete base made of the materials and in accordance with the method prescribed for cement and concrete adopted at the 1913 meeting, and shall be not less than six (6) inches thick at all points.

NOTE: The thickness of the base may be reduced to five (5) inches on light traffic streets and in exceptional cases to four (4) inches at the discretion of the Engineer.

Upon the foundation shall be laid the pavement proper. This shall consist of:

1. A binder course — inches in thickness when compressed.
2. An asphalt wearing surface — inches in thickness when compressed.

REFINED ASPHALT.

The refined asphalt to be used for paving mixtures herein required shall be derived in the following manner:

1. By heating, if requiring refinement, crude, natural, solid asphalt, to a temperature of not over 400 degrees F., until all the water has been driven off. Crude, natural, solid asphalt shall be construed to mean any natural solid mineral bitumen, either pure or mixed with foreign matter, from which through natural causes in the process of time the light oils have been driven off until it has a consistency harder than 100 penetration at 77 degrees F. At least 98½ per cent of the contained bitumen in the refined asphalt which is soluble in cold carbon disulphide, shall be

soluble in cold carbon tetrachloride. In no case shall such asphalt be prepared at the refinery with any product not hereinafter provided for.

2. By the careful distillation of asphaltic petroleum with continuous agitation until the resulting bitumen has a consistency not harder than 30 penetration at 77 degrees F.

(a) All shipments of material shall be marked with a lot number and penetration, and ten samples taken at random from each lot shall not vary more than 15 per cent from the average penetration, providing no part of any shipment shall be below 30 penetration at 77 degrees F.

(b) The solid bitumen so obtained shall be soluble in carbon tetrachloride to the extent of 98½ per cent.

(c) When 50 grams of the material are heated for five (5) hours at a temperature of 325 degrees F. in a tin box 2¼ inches in diameter and 1¾ inches high, after the manner officially prescribed, it shall not lose over 3 per cent by weight nor shall the penetration at 77 degrees F. after such heating be less than one-half of the original penetration.

(d) The solid bitumen at a penetration of 50 shall have a ductility of not less than 20 centimeters at 77 degrees F. If the penetration varies from 50 an increase of at least 2 centimeters in ductility will be required for each 5 points in penetration above 50, and a corresponding allowance will be made below 50 penetration. This test shall be made with a briquette of cross-section of one square centimeter, the material being elongated at the rate of 5 cms. per minute. (Dow Moulds.)

Note: Combinations of asphaltic bitumens having the ductility and other characteristics above mentioned are admitted under Section 2.

3. Refined asphalt produced by combining crude natural asphalt with either of the following:

(a) Residuums obtained by the distillation of petroleum oils as specified under fluxes.

(b) Asphalts obtained by the distillation of petroleum oils as specified.

In the use of these mixtures of refined asphalts for asphaltic cement, only asphaltic or semi-asphaltic fluxes shall be used, except in those cases where the solid natural asphalt is of such character that when mixed with paraffine flux without the addition of any other material, it will produce an asphaltic cement complying with the requirements set forth under that head. In such cases any of the fluxes elsewhere specified may be used.

The preparation and refining of all asphalt admitted under these specifications shall be subject to such inspection at the paving plant and refineries as the (proper city official) may direct.

FLUX.

The fluxing material may be a paraffine, a semi-asphaltic or an asphaltic residue which shall be tested with and found suitable to the asphalts to be used.

The residuums must have a penetration greater than 350 degrees with a No. 2 needle at 77 degrees F. under 50 grams weight for one second.

All residuums shall be soluble in cold carbon tetra chloride to the extent of 99 per cent, and must remain soft after heating for 5 hours at 400 degrees F.

(a) The paraffine residuum shall have a specific gravity of 0.92 to 0.94 at 77 degrees F. It shall not flash below 350 degrees F., open cup method, and shall not volatilize more than 5 per cent of material when heated 5 hours at 325 degrees F. in a tin box $2\frac{1}{4}$ inches in diameter and $1\frac{3}{4}$ inches high as officially prescribed. The residue after heating shall flow at 77 degrees F. and shall be homogeneous and shall show no coarse crystals.

(b) Semi-asphaltic residuum shall have the same general characteristics as paraffine residuum except that it shall have a specific gravity of 0.94 to 0.98 at 77 degrees F.

(c) Asphaltic residuum shall have the same general characteristics as paraffine residuum except that the specific gravity shall be not less than 0.98 nor more than 1.01 at 77 degrees F.

ASPHALTIC CEMENT.

The asphaltic cement prepared from materials above designated shall be made up from the refined asphalt or asphalts, and the flux, where flux must be used, in such proportions as to produce an asphaltic cement of a suitable degree of penetration. The proportion of the refined asphalt comprising the cement shall in no case be less than 40 per cent by weight.

When the weight of flux in the asphaltic cement prepared from solid natural asphalt exceeds 25 per cent thereof, asphaltic or semi-asphaltic flux shall be used.

Refined asphalts and flux comprising the asphaltic cement shall, when required, be weighed separately in the presence of the authorized inspectors or agents of (proper city official).

Refined asphalts and flux used in preparing the cement shall be melted together in a kettle at temperature ranging from 250 degrees to not over 375 degrees Fahr. and be thoroughly agitated when hot by air, steam or mechanical appliances, until the resulting cement has become thoroughly mixed into a homogeneous mass. The agitation must be continued during the entire period of preparing the mixtures. Cement shall always be of uniform consistency, and if any portion should settle in the kettle between intervals of using the same, it must be thoroughly agitated before being drawn for use.

(a) The asphaltic cements shall have a penetration of from 40 to 75, which shall be varied within these limits to adapt it to the particular asphalts used in the paving mixture and to the traffic and other conditions.

(b) When 50 grams of the asphaltic cement of the penetration to be used in the paving mixture shall be heated for five (5) hours at a temperature of 325 degrees Fahr. in an air bath, as officially specified, there must not be volatilized more than 3 per cent of the bitumen present, nor shall the penetration at 77 degrees Fahr. after such heating be less than one-half of the original penetration.

(c) A briquette of the asphaltic cement when at a penetration of 50 having a cross section of one square centimeter shall elongate to the extent of not less than 20 centimeters at 77 degrees Fahr. If the asphaltic cement as used in the paving mixture varies from 50 penetration, an increase of at least 2 centimeters in ductility will be required for each five (5) points in penetration above 50, and a corresponding allowance will be made below 50 penetration. (Dow Moulds.)

SAND.

The sand shall be hard-grained and moderately sharp. It shall be so graded as to produce, in the finished surface mixture, the mesh requirements elsewhere specified. It shall contain not to exceed 6 per cent of sand that will pass a No. 200-mesh sieve.

BINDER STONE.

Stone or gravel to be used for asphaltic concrete binder shall be hard and durable, free from all foreign substances, and of uniformly varying sizes, from one inch down.

ASPHALTIC CONCRETE BINDER.

Asphaltic concrete binder shall be made as follows: The binder stone and sand as above specified shall be heated to from 200 to 325 degrees Fahr. in suitable appliances. Stone and sand shall be measured off separately and then be mixed, with sufficient asphaltic cement prepared as heretofore specified, in such proportions that the resulting aggregate will contain by weight material passing a No. 10-mesh screen, between 25 and 35 per cent, and bitumen in quantity from 5 to 8 per cent of the entire mixture. Binder thus prepared shall be a compact mass containing a minimum of voids. With the permission of (proper city officials) when available, old asphaltic surface paving mixtures may be used in combination with the binder stone, such mixtures having been previously crushed or disintegrated and augmented with at least 1 per cent of fresh asphaltic cement, so that when combined, the resulting binder shall form an equally compact mass and correspond as to aggregate passing a No. 10-mesh screen and its contained percentages of bitumen with the requirements for the mixture previously specified.

NOTE: Inasmuch as the percentage of bitumen in the binder will depend upon the grading of the aggregate, the proportion of the materials used in the above may be varied by (authorized city official) but not only within the limits designated.

LAYING ASPHALTIC CONCRETE BINDER.

The asphaltic concrete binder shall be brought to the work in wagons covered with canvas or other suitable material, and upon reaching the street shall have a temperature of 200 to 325 degrees Fahr. It shall be placed upon the street and raked to a uniform surface to such depth that, after being rolled and thoroughly compacted, it shall have an average thickness of ——— inches. The surface, after compression, shall show at no place an excess of asphaltic cement, and any spot covering an area of one square foot or more showing an excess of asphaltic cement, shall be cut out and replaced with other material. Smaller spots may be dried by the use of stone dust and smoothers. Any asphaltic concrete binder broken up during the process of laying must be removed and replaced with new material. No more binder shall be laid at any one time than can be covered by two days' run of the paving plant on surface mixture.

ASPHALTIC SURFACE MIXTURE OR WEARING COURSE.

The surface mixture shall consist of asphaltic cement, Portland cement or stone dust, and sand proportioned by weight so that the resulting mixture will contain average proportions of the whole mixture as follows:

Bitumen soluble in cold carbon disulphide.....	9.5 to 13.5%
Portland cement or stone dust passing a No. 200 sieve....	10.0 to 15.0%
Sand passing a No. 80 sieve.....	18.0 to 36.0%
Sand passing a No. 40 sieve.....	20.0 to 50.0%
Sand passing a No. 10 sieve.....	8.0 to 25.0%
Sand passing a No. 4 sieve.....	up to 10.0%

The item designated as "Portland cement or stone dust passing a No. 200 sieve" within the limits named herein, includes in addition to the Portland cement or stone dust fine sand passing a No. 200 sieve not exceeding a $4\frac{1}{2}$ per cent of the total mixture, and such 200 mesh mineral dust naturally self-contained in the refined asphalt.

Sand and asphaltic cement shall be heated separately to about 300 degrees Fahr. The maximum temperature of the sand at the mixers shall in no case be in excess of 375 degrees Fahr. and the maximum temperature of the asphaltic cement shall not exceed 325 degrees Fahr. at the discharge pipe. The Portland cement or stone dust shall be added to the hot sand and in the required proportions and the two thoroughly mixed. The asphalt cement in the proper proportions shall then be added and the mixing continued for at least one minute in a suitable apparatus until a homogeneous mixture is produced in which all the particles are thoroughly coated with asphalt cement.

The proportion of asphaltic cement shall at all times be determined by actual weighing with scales attached to the asphaltic cement bucket.

The Portland cement or stone dust and sand must also be weighed unless a method of gauging approved by the (authorized city official) shall be used.

The contractor shall furnish every facility for the verification of all scales or measures.

The sand gradings and bitumen may be varied within the limits designated in the discretion of (proper city official).

LAYING THE WEARING SURFACE.

The asphalt wearing surface shall be hauled to the work in wagons provided with a canvas or other suitable cover. As placed in the street it shall have a minimum temperature of 250 degrees to 280 degrees Fahr., as suitable for the asphalt used. It shall be dumped at such distance from the work that all the mixture must be turned and distributed to the place where it is to be raked, and shall be spread, while hot, to such depth upon the asphaltic concrete binder, which must be thoroughly dry, free from leaves or other foreign matter, that after receiving its ultimate compression by rolling, it shall have an average thickness of inches. The initial compression shall be effected by means of a small roller, after which a small amount of mineral dust shall be swept over the surface. Final compression shall be effected by a roller of not less than 250 pounds per inch tread. The rolling shall

be carried on continuously at the rate of not more than 200 square yards per hour.

All tests herein provided must be conducted according to official methods on file in the office of the (proper official).*

All penetrations indicated herein, unless otherwise specified, refer to the depths of penetration in hundredth centimeters of a No. 2 cambric needle weighted to 100 grams at 77 degrees Fahr. acting for 5 seconds.

REQUIREMENTS AS TO CONDITION OF PAVEMENT AT EXPIRATION OF
GUARANTEE.

Just before the expiration of the guarantee period, the contractor shall, at his own cost and expense, make such repairs as may be ordered by the (proper city official) and as may be necessary to produce a pavement which shall:

1. Conform substantially in contour to the pavement as first laid.
2. Be free from cracks or depression showing disintegration of the surface mixture.
3. All settlements of surface of the pavement holding water or other settlements showing a variation in elevation of three-eighths ($\frac{3}{8}$) inch or more from the edge of a two-foot straight edge must be brought to conform to the true crown and grade of the pavement.
4. Contain no disintegrated surface mixture.
5. Have a foundation free from cracks or defects, which are evidenced by disintegration or subsidence of the surface mixture.
6. Whenever the repairs necessary to be made at the expiration of the guarantee period in accordance with this section shall amount to more than fifty (50) per cent of the surface of any one block, the entire pavement on that block shall be taken up and relaid in accordance with these specifications.

Respectfully submitted.

G. W. TONSON, Chairman,
Chief Engineer, Dept. Public Service, Toledo,
Ohio.

OTTO H. KLEIN, Vice-Chairman.
Director Standard Testing Laboratory of the
City of New York.

M. S. EVANS,
Chief Chemist, Bureau of Construction, Pitts-
burgh, Pa.

C. H. UNDERWOOD,
Engineering Chemist, Indianapolis, Indiana.

JOSEPH H. RYAN,
Supt. Municipal Asphalt Plant, Pittsburgh, Pa.

L. D. CUTCHEON,
Secretary and General Manager Board of Public
Works, Grand Rapids, Mich.

*The following methods of test are those recommended by the Committee on Asphalt Paving Specifications and by action of the Association

were ordered printed in the proceedings and definite action thereon postponed until the next meeting of the Association, as shown on page 60.

THE METHODS OF TESTING ASPHALT FLUX AND ASPHALTIC CEMENT SHALL BE AS FOLLOWS:

SAMPLES.

Samples for testing shall be submitted in airtight tin containers in the following amounts:

Refined asphalts or asphaltic cement: Not less than 1 pound.

Flux: Not less than 1 pint.

PENETRATIONS.

Penetrations shall be taken by means of one of the standard forms of penetrometers.

In transferring the sample to the tin box or after transferring, it shall be melted at a temperature not exceeding that of a boiling water bath. The sample shall be thoroughly stirred while in a molten condition, until it is free from air bubbles.

Before determining the penetration, the sample shall be maintained at the specified temperature for at least one-half hour.

During the test, the sample shall be accurately maintained at the temperature specified.

An average of from three to five tests which shall not differ more than 0.3 millimeter between maximum and minimum shall be taken as the penetration of the sample; the needle being wiped after every determination.

TOTAL BITUMEN.

The total bitumen shall be determined by the methods of the Office of Public Roads of the United States Department of Agriculture, modified as follows:

"From 1 to 2 grams of bitumen is placed in the Erlenmeyer flask, which has been weighed previously, and the accurate weight of the sample is obtained. One hundred cubic centimeters of chemically pure carbon disulphide is poured into the flask in small portions, with continual agitation, until all lumps disappear and nothing adheres to the bottom. The flask is then corked and set aside for 15 minutes.

"After being weighed, a Gooch crucible containing a felt is set up over a dry pressure flask and the solution of bitumen and carbon disulphide is decanted through the felt without suction by gradually tilting the flask, with care not to stir up any precipitate that may have settled out. At the first sign of any sediment coming out, the decantation is stopped and the filter allowed to drain. A small amount of carbon disulphide is then washed down the sides of the flask, after which the precipitate is brought upon the felt and the flask scrubbed, if necessary, with a feather or 'policeman' to remove all adhering material. The contents of the crucible are washed with carbon disulphide until the washings run colorless. Suction is then applied until there is practically

no odor of carbon disulphide in the crucible, after which the outside of the crucible is cleaned with a small amount of the solvent. The crucible and contents are dried in the hot-air oven at 100 degrees C. for about 20 minutes, cooled in a desiccator, and weighed. If any appreciable amount of insoluble matter adheres to the flask, it should also be dried and weighed, and any increase over the original weight of the flask shall be added to the weight of the insoluble matter in the crucible. The total weight of the insoluble matter may include both organic and mineral matter. The former, if present, is burned off by ignition at a red heat until no incandescent particles remain, thus leaving the mineral matter or ash, which can be weighed on cooling. The difference between the total weight of the material insoluble in carbon disulphide, and the weight of the substance taken, equals the total bitumen, and the percentage weights are calculated and reported as total bitumen, and organic and inorganic matter insoluble, on the basis of the weight of material taken for analysis.

"This method is quite satisfactory for straight oils and tar products, but where natural asphalts are present it will be found practically impossible to retain all of the finely divided mineral matter on an asbestos felt. It is, therefore, generally more accurate to obtain the result for total mineral matter by direct ignition of a 1-gram sample in a platinum crucible or to use the result for ash obtained in the fixed carbon test. The total bitumen is then determined by deducting from 100 per cent the sum of the percentages of total mineral matter and organic matter insoluble. If the presence of a carbonate mineral is suspected, the percentage of mineral matter may be most accurately obtained by treating the ash from the fixed carbon determination with a few drops of ammonium carbonate solution, drying at 100 degrees C., then heating for a few minutes at a dull red heat, cooling, and weighing again."

In the analysis of asphalts and cements containing fine mineral matter, the rapid method of the American Society for Testing Materials shall be used.

"From 2 to 15 grams (depending on the richness in bitumen of the substance) is weighed into a 150-cubic centimeter Erlenmeyer flask, the tare of which has been previously ascertained, and treated with 100 cubic centimeters of carbon disulphide. The flask is then loosely corked, and shaken from time to time until practically all large particles of the material have been broken up, when it is set aside and not disturbed for 48 hours. The solution is then decanted off into a similar flask that has been previously weighed, as much of the solvent being poured off as possible, without disturbing the residue. The first flask is again treated with fresh carbon disulphide and shaken as before, when it is put away with the second flask and not disturbed for 48 hours.

"At the end of this time, the contents of the two flasks are carefully decanted off upon a weighed Gooch crucible fitted with

an asbestos filter, the contents of the second flask being passed through the filter first. The asbestos filter shall be made of an ignited long-fibre amphibole, packed in the bottom of a Gooch crucible to the depth of not over one-eighth of an inch. After passing the contents of both flasks through the filter, the two residues are shaken with more fresh carbon disulphide and set aside for 24 hours without disturbing, or until it is seen that a good subsidence has taken place, when the solvent is again decanted off upon the filter. This washing is continued until the filtrate or washings are practically colorless.

"The crucible and both flasks are then dried at 125 degrees C. and weighed. The filtrate containing the bitumen is evaporated, the bituminous residue burned, and the weight of the ash thus obtained added to that of the residue in the two flasks and the crucible. The sum of these weights deducted from the weight of substance taken, gives the weight of bitumen extracted."

BITUMEN SOLUBLE IN CARBON TETRACHLORIDE.

One gram of sample shall be weighed into a 200 cc. wide-mouthed Erlenmeyer flask, covered with 100 cc. of chemically pure carbon tetrachloride and allowed to stand 18 hours in the dark. At the end of this time, the insoluble shall be filtered off on a Gooch crucible and the material on the filter felt washed with not to exceed 100 cc. of fresh solvent.

VOLATILIZATION TEST.

About 20 grams of sample shall be placed in a weighted tin box $2\frac{1}{4}$ inches diameter by $1\frac{3}{4}$ inches high (3 oz. Gil. style can, obtainable from the American Can Co.) and heated 5 hours at 325 degrees F. The heating shall be done in a ventilated oven, which shall have reached the temperature specified before the introduction of the samples, and which is maintained within two degrees of that temperature throughout the test.

FLASH POINT.

Shall be taken in the Cleveland open tester.

PARAFFINE DETERMINATION.

Where paraffine determinations are required, they shall be made according to the method given on page 33 of Bulletin No. 38 of the Office of Public Roads.

SPECIFIC GRAVITY.

(a) Fluid materials: The specific gravity of fluid materials shall be taken in the usual way in a picnometer at 77 degrees F.

(b) Viscous fluid and semi-solid materials: The specific gravity of these materials shall be taken in a cylindrical weighing bottle picnometer as given on page 10, Bulletin No. 38, of the Office of Public Roads.

(c) Hard solid materials: The specific gravity of hard solid materials shall be taken by the displacement method.

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PRESIDENT HARDEE: We will call on the Committee on Bituminous Concrete Paving Specifications for its report, Mr. White, Chairman.

MR. WHITE: (Reads report.)

MR. SHERRERD: The other specification recommended a change in the size of the box.

MR. WHITE: That is a point that perhaps missed us. We did not change the size of the box. However, it was the intention of the committee to be consistent with the determination of the Asphalt Committee on that point.

MR. TILLSON: Absolutely; that is what we are here for. If your committee is willing to change it.

MR. WHITE: I think I can speak for the committee that we will word it the same as the Asphalt Committee, $2\frac{1}{4}$ inches in diameter by $1\frac{3}{4}$ inches in height.

The committee has introduced a specification providing for water gas tar cement (reading). That completes the specifications for bituminous cement.

With reference to the maintenance bond, your committee made no change in that.

The report is signed by all the members of the committee. I wish to say that the committee held open session and asked the different associate members representing materials and supplies to offer suggestions, which was done by a number, for which the committee thanks them. Their suggestions were taken under consideration.

Mr. Chairman, if it is in order, I move the adoption of the report.

MR. TILLSON: I second the motion.

PRESIDENT HARDEE: Gentlemen, you have heard the report read, and it has been moved and seconded that the report be adopted. The matter is now open for discussion.

THE QUESTION.

No one desires to discuss the matter. I will then put the motion. All in favor of the adoption of the report will signify by saying "Aye." Contrary "No." The "Ayes" have it; the report stands adopted.

The following is the amended and adopted

REPORT OF THE COMMITTEE
ON
BITUMINOUS CONCRETE PAVING SPECIFICATIONS.

Pittsburgh, Pa., February 25th, 1913.

To the President and Members of
The Association for Standardizing
Paving Specifications.

Gentlemen: Your Committee begs to offer the following revised specifications for Bituminous Concrete.

It is the understanding of your Committee that the term Bituminous Concrete is properly applied to any mixture suitable for paving purposes, composed of broken stone, sand and bituminous cement, mixed together before being laid, and which is laid while in a plastic condition. If the stone is spread in place and the bituminous cement or binder applied afterward, the resulting product is Bituminous Macadam.

The following specifications have been drawn up in accordance with these definitions.

It is the belief of your Committee that bituminous concrete may be successfully used as a paving material under a great variety of conditions and traffic; that it is adapted to use on a standard concrete base and on a well constructed Macadam base, either new or old, and therefore finds an especial field in providing a permanent wearing surface for old Macadam.

In the preparation of these specifications your Committee has endeavored to recommend only methods, proportions and materials that have been tried and proved successful under a variety of conditions. For this reason only the bituminous cements have been considered that retain approximately their original consistency after going through the process of mixing and laying and are permanent in quality thereafter, excluding from consideration emulsions, oils volatile in character and cements softened with light fluxes so they may be worked cold or at low temperatures. Thus the cements specified are practically solid at ordinary atmospheric temperatures and require to be heated and mixed with the stone and sand while they are hot. The processes specified require the use of standard machinery in which the bituminous cement is not exposed directly to the action of fire during the process of mixing.

In these particulars your Committee has endeavored to be conservative, believing there is danger in offering anything but tried and proved materials and methods in a standard specification.

Your Committee does not consider that the following specifications should be used in their entirety exactly as written in any case, as the effort has been made to produce specifications general in character which may be adapted to varying conditions of traffic. Thus the extreme range of penetration for asphaltic cement has been made from 40 to 80, which is too wide a range to admit for any particular case. A penetration of 40 will give a hard and stable pavement, while 80 will give a pavement too soft for heavily traveled streets. The choice should be

made to meet conditions and the specifications applying to any particular case drawn closer within the limits named for penetration, working temperatures, etc. The Engineer in charge should secure complete reliable analyses from chemists making a specialty of bituminous cements, of the cements he contemplates using and compare them on all important points, not considering that because a cement comes within the limit named herein he is securing the best.

Asphaltic cements made from both natural and manufactured asphalts come within the requirements of the following specifications.

Your Committee has prepared two specifications, designated for convenience as "Specification X" and "Specification Y."

It is not attempted by your Committee to pass upon the validity of certain patents that have been issued for pavements, and the various municipalities that may adopt Specification X are advised to determine their own policies as to the recognition of these patents.

Specification Y, however, your Committee believes provides for a construction about which there can be no question raised of patent infringement.

BITUMINOUS CONCRETE PAVEMENT.

SPECIFICATION X.

SUB-GRADE.

The Contractor will be required to do all of the grading necessary to bring the surface to the proper sub-grade as determined by the lines and grades given by the Engineer. If the material at sub-grade is of an unstable character and unfit for foundation the contractor shall make such additional excavation as may be determined by the Engineer and refill with approved material. After all necessary grading has been done to bring the surface to sub-grade, the street shall be thoroughly rolled with an approved road roller, weighing not less than 10 tons. If settlement occurs the depression shall be filled and then re-rolled until the surface is solid, uniform and parallel with the grade and cross section of the finished pavement. All filling shall be free from animal or vegetable matter and of a character approved by the Engineer. In cases of spongy or yielding sub-grade some other means besides ordinary rolling and sprinkling must be employed to obtain satisfactory compaction of the sub-grade. In the case of loose, sandy soils a small amount of cinders, gravel or fine crushed stone spread over the surface will often put it in a condition to be compacted under the roller. In the case of clay soils that puddle up and wave or creep under continued rolling it is best to roll as dry as possible and to be sparing in the use of water when rolling the first layer of macadam. Cinders, gravel or stone screenings will often help in rolling such sub-grades.

SUB-DRAINAGE.

When the soil is of such a character that it retains an excessive amount of moisture, such as clay subject to swelling or heaving under the action of frost, or sands similar to quick sand that do not afford a ready natural drainage, sub-drains should be provided.

These may be of two general kinds; first, tile drains of open porous material or vitrified tile laid with open joints; second, trenches filled with broken stone, gravel, cinders or other similar material.

In some cases it may be sufficient to construct a sub-drain on each side of the roadway at or near the lines of the gutters, but when the soil is of a very wet nature it may be advisable to lay additional lines of drains which may be in or near the middle of the roadway. This system of drains may be varied by diagonal lines of drains running from near the crown of the roadway to the gutters.

In all cases the drains should have connections with the existing sewers, catch basins or inlets.

NEW MACADAM FOUNDATION.

If the pavement is to be laid on a new macadam foundation, the macadam shall be built as follows:

The total thickness of the macadam base will vary according to character of soil, drainage, kind of stone available, etc. In general, the macadam base should be constructed of broken stone which is sound, hard and durable under traffic. The broken stone should be separated into different sizes by screening, the smaller sizes with the dust being used to fill and bond together the larger sizes. The thickness of the base should be regulated by experience in constructing ordinary water-bound macadam roads in similar situations, the total thickness of pavement, including wearing surface, being made the same or a little less than well constructed macadam.

After the sub-grade has been properly prepared spread a layer of clean stone passing a three (3) to three and one-half ($3\frac{1}{2}$) inch revolving screen and held on a two (2) inch screen to a depth sufficient when thoroughly rolled to form about two-thirds ($\frac{2}{3}$) of the total thickness of the base. The thickness of this layer should be regulated by laying on the sub-grade at proper intervals cubical blocks of wood of the proper dimensions to give the desired thickness. Over this layer of stone spread with shovels stone screenings in sufficient quantity to fill the voids between the larger stone. The screenings should be spread gradually and thoroughly rolled with a road roller weighing at least 10 tons during the process of spreading the screenings. As the screenings are worked into the coarse stone under the roller, more should be added here and there where voids appear. At first the rolling should be done dry until the stone appears to be well filled, then the surface should be well sprinkled and again rolled, the rolling and sprinkling continued until the layer of stone is thoroughly compacted and no more screenings can be forced in. Just enough screenings shall be used to fill and bond the stone, leaving no surplus screenings on the top.

The above method may be varied by using the crusher run of stone without the addition of any other filler where the small sizes are not in excess. Also a filler other than stone screenings, such as bank gravel or sand may be used in some cases where experience with the materials available show better results can be obtained. Under some conditions the character of soil and stone available may be such as not to require the use of any filler with the stone of the first course. The specifications

given, however, represent the best average practice where stone with bonding value, such as limestone or trap rock, can be obtained.

When the first layer of macadam is completed as specified, spread a second layer of clean stone passing a two (2) or two and one-half ($2\frac{1}{2}$) inch screen and held on a one (1) inch screen to a depth sufficient when thoroughly rolled to form the remaining one-third ($\frac{1}{3}$) of the total thickness of the base. Over this layer of stone spread evenly with shovels stone screenings and roll with the application of water by sprinkling, until the layer of stone is well bonded and firmly set in place. Just enough filler should be used to accomplish this purpose and not enough to form a layer or film over the surface of the stone. It is better not to fill the stone quite flush, leaving the coarse particles of stone slightly projecting, so as to have a coarse, grainy base upon which to put the wearing surface.

The thickness of the pavement, including base and wearing surface, should vary according to local conditions and should be fixed by the Engineer in charge when all the varying conditions of soil, drainage, traffic and materials of construction are understood. In general, a thickness of macadam base of eight inches with a wearing surface of two inches will be enough for any except the most adverse conditions, and a base of four to four and one-half inches with a wearing surface of from one and one-half to two inches will meet the most favorable conditions of firm, unyielding soils and light traffic.

OLD MACADAM FOUNDATION.

If the pavement is to be laid on an old macadam base, the surface shall be thoroughly swept and cleaned of all fine material that may be caked upon the surface of the stone or lying loose as dust, thereby exposing the clean coarse stone for the reception of the bituminous concrete.

If the old macadam does not present the desired coarse, grainy surface, or is not at proper and satisfactory grade after cleaning, it shall be spiked up and redressed to the desired crown and grade, the coarse stone being brought to the top by harrowing or otherwise, or new stone added when, in the opinion of the Engineer in charge, it is needed to give the necessary grainy surface or thickness of foundation. It shall then be thoroughly rolled with the use of as little water as possible so the surface of the macadam does not flush up smooth.

CONCRETE FOUNDATION.

When a Portland cement concrete foundation is used, it should be laid according to the standard specifications for concrete foundation prepared by the Committee on Cement and Concrete Paving Specifications adopted by this Association.

CURB.

If a curb or curb and gutter is used, the face against which the paving material will be laid shall be painted with a coat of hot bituminous cement in advance of the pavement.

A curb or curb and gutter should be used in all cases of a street devoted to miscellaneous uses and where there is occasion for many

vehicles to stop at the curb line, but in the case of a park driveway or a suburban highway a bituminous concrete pavement may be successfully used without a curb. No other protection for the edge of the pavement is required except to provide a coarse grainy base into which the paving material is rolled.

WEARING SURFACE.

On the foundation, as heretofore specified, shall be laid the bituminous concrete wearing surface, which shall consist of a mineral aggregate mixed with bituminous cement and laid as hereinafter specified.

This wearing surface shall have a thickness of inches after thorough compression with a roller.

For heavy traffic a thickness of two (2) inches is sufficient for all practical purposes and in some cases will afford more stability than a greater thickness.

For moderate and light traffic one and one-half ($1\frac{1}{2}$) inches will be sufficient thickness for the wearing surface when laid on a well-constructed base, as specified above.

MINERAL AGGREGATE.

The mineral aggregate shall consist of a mixture of broken stone and sand, to which in some cases may be added a small quantity of stone dust or Portland cement.

Any sound, durable stone, either trap rock, limestone or granite, usually considered suitable for macadam, may be used. It should be broken as nearly cubical as practicable. It should not show distinct planes of cleavage or crystalline faces and should not readily crush or split under the roller when being rolled in the pavement. Between two kinds of stone, choice should generally be made of the one showing the greater toughness rather than hardness. A certain percentage of absorption, such as is shown by the better grades of limestone, is a desirable quality, as the bonding strength of the cement is somewhat improved thereby.

The stone shall vary in size from a maximum of about half the thickness of the wearing surface to the smallest particle retained on the finest mesh screen commonly used on crushing plants. That is, the minimum screen should be one-fourth ($\frac{1}{4}$) inch for dry stone and one-half ($\frac{1}{2}$) inch for wet stone.

The dust or fine screenings should be removed from the stone, as it usually is excessive and irregular in quantity and necessitates the use of a greater amount of cement.

The sand shall be hard grained, moderately sharp, free from loam or other foreign material and varying in size from that passing a one-quarter ($\frac{1}{4}$) inch screen to dust passing a 200 mesh screen. There shall not be over 5 per cent passing the 200 mesh screen and there should not be over 30 per cent held on the 10 mesh screen.

The proportions of the various ingredients composing the bituminous concrete shall be approximately three (3) parts of stone to two (2) parts of sand, to which shall be added from 7 per cent to 10 per cent by weight of the bituminous cement.

Under certain conditions dust in the form of finely ground limestone or Portland cement may be added to the mixture, but in such quantities that the screening of the combined aggregate shall in no case show over ten per cent (10%) by weight passing a 200 mesh screen.

The dust or Portland cement should be used only in the following cases: (1) When the traffic is heavy and it is desired to harden and stiffen up the paving mixture, in which case the percentage of bituminous cement should be increased to about 9 to 10 per cent by weight of the whole mixture; and (2) when a bituminous cement of great ductility and short range of temperature is used, in which case the percentage of bituminous cement should not exceed 9 per cent.

In general, the percentage of bituminous cement used should be varied according to the varying characteristics of the mineral aggregate—the more fine material there is in the mixture the greater the percentage of bituminous cement.

METHOD OF MIXING.

The aggregate shall be dried and heated in properly designated driers before mixing with the bituminous cement. The driers shall be of the revolving type, thoroughly agitating and turning the materials during the process of drying. When the aggregate is thoroughly dried and heated to a temperature of from 200 to 350 degrees F., depending upon the bituminous cement used, it shall be immediately, before cooling or exposure to moisture, mixed with the hot bituminous cement as herein-after specified. If stone dust is used it shall be introduced directly into the mixer without passing through the drier.

The bituminous cement shall be melted in a tank arranged so the heat can be properly and easily controlled and regulated. When melted and raised to a temperature of from 200 to 350 degrees F., depending on the bituminous cement used, it shall be combined in the proper proportions with the hot aggregate and immediately mixed in a properly designed mixer with revolving blades until a thorough and intimate mixture of the ingredients has been accomplished, and the particles composing the aggregate evenly and thoroughly coated with the bituminous cement. The mixer shall not be exposed directly to the action of fire.

METHOD OF LAYING.

While still hot from the mixer the paving mixture shall be spread evenly on the foundation with hot iron rakes and shovels, so that when compressed with the roller it shall have the thickness specified, with the surface even and true to grade. Along the curb and around man-holes, catch basins and other obstructions in the street, where the roller cannot reach, the compression shall be secured by the use of hot iron tampers. The rolling and tamping shall be done as quickly as possible after the material is spread, while still hot and pliable. When the paving mixture is hauled on the street in dump wagons it shall be, when ordered by the Engineer, kept covered with canvas to retain heat, dumped on platforms and shoveled into place and raked to the proper grade. As soon as spread the paving mixture shall be rolled with a tandem road

roller weighing at least five (5) tons and the rolling continued, working lengthwise and diagonally of the street. When practicable additional compression in the wearing surface should be secured by the use of a ten ton roller. Rolling must be steadily kept up and continued until all roller marks shall disappear, and the surface gives indications of no further compressibility.

The paving shall be done continuously, so the number of joints between the hot and cold material may be reduced to the minimum. When it is not practicable to lay it continuously and a joint is unavoidable, the edge of the cold material shall be trimmed down to a rough feather edge, and the surface, where the joint is to be made, painted over with bituminous cement, the hot material raked over the feathered edge and thoroughly rolled. Instead of trimming the cold material, joint strips may be used consisting of strips of canvas about eighteen (18) inches wide with three parallel lines of three-quarter ($\frac{3}{4}$) inch ropes sewed on the underside about three (3) inches apart. The joint strips shall be laid on the feather edge of the freshly-raked material with the upper rope at the line where the thickness begins to decrease and the rolling completed on top of the canvas as for finished pavement. The faces of the curb and gutter, iron castings, etc., shall be painted with the bituminous cement before the paving mixture is laid.

SURFACE FINISH.

As soon as possible after the rolling of the mixture is finished, and while the surface is still fresh and clean, and, if possible, while warm, a seal coat of bituminous cement of proper consistency to be flexible when cold shall be spread over the surface. It shall be applied while at a temperature of from 200 degrees to 350 degrees F., depending on the bituminous cement used, and evenly spread with rubber squeegees or mops. Only a sufficient coat shall be spread to flush the surface voids without leaving an excess. Immediately over this a top dressing of torpedo sand, fine gravel or stone chips free from dust, which must be thoroughly dry and heated in cold weather, shall be spread and thoroughly rolled into the surface. A small surplus shall be left to be worn in or worn away by the traffic.

In the case of park drives and roadways not subjected to heavy, constant traffic, and where a more grainy and coarse surface is desired, the surface finish specified above may be omitted and the following method of finishing adopted.

As the bituminous concrete is raked to grade, and just before the roller comes on it, spread dry stone chips or torpedo sand evenly with swinging motions of a shovel, until the surface is barely covered. Then roll thoroughly as specified in the preceding paragraph relating to method of laying. If bare spots appear under the roller, sprinkle more chips or sand and continue the rolling until the whole surface is fairly covered.

After the sand or stone chips have worn into the surface the street shall be swept, all excess of surfacing material removed and the street left clean.

BITUMINOUS CONCRETE PAVEMENT.

SPECIFICATION Y.

MACADAM BASE.

The macadam base shall be constructed according to the specifications for macadam base under Specification "X," except that the upper layer of macadam shall be thoroughly filled flush to the top of the coarse particles of stone, leaving a small surplus of screenings in some cases, so the surface may be practically smooth. As this specification provides for a binder course and wearing surface which in most cases will, taken together, be thicker than the one layer pavement called for under Specification "X," the macadam base may be made correspondingly thinner so that the total thickness of the completed pavement, including base, will be the same under similar conditions.

CONCRETE BASE.

When a Portland cement concrete foundation is used, it should be laid according to the standard specifications for concrete foundation prepared by the Committee on Cement and Concrete Paving Specifications adopted by this Association.

PAVEMENT.

The pavement shall consist of two courses, a binder course and a wearing surface.

BINDER COURSE.

The binder course for macadam base shall be composed of a layer of coarse, clean stone of a size to pass a two (2) or two and one-half ($2\frac{1}{2}$) inch ring and be retained on a one (1) inch ring. It shall be evenly distributed over the surface of the macadam base described above, one and one-half inches or practically only one stone deep and rolled until the stones are practically level and forced partially into the macadam base. The rolling should be comparatively light, only enough to partially imbed the stone and set them firmly in place without crushing them or forcing the fine material up from below to completely fill the voids. This rolling should be done while the macadam base is still moist and comparatively soft. The stone of the binder course may be laid (1) without any coating or application whatever, (2) with an application of light bitumen after laying and rolling, or (3) coated with a bituminous cement before being laid.

If the stone is of such a character that it is covered with a film of dust a light application of asphaltic oil, petroleum distillate or tar of such a consistency that it will flow readily and penetrate at ordinary atmospheric temperature shall be supplied in just sufficient quantities to cover, leaving no appreciable surplus to be taken up by the paving material.

If the stone is coated with a bituminous cement before being laid it shall be done by heating the stone and the cement and mixing while hot. Just enough cement shall be used to coat the stone thoroughly. The cement should be a bituminous cement of the same character and consistency as the cement used in the wearing surface.

When a concrete base is used the binder course shall be laid as called for under the Standard Specifications for sheet asphalt pavements or omitted entirely and the surface of the concrete base covered with a paint coat of bituminous cement of the proper consistency applied hot.

WEARING SURFACE.

The wearing surface shall consist of a paving composition of bituminous cement and mineral aggregate spread evenly and rolled into the binder course.

MINERAL AGGREGATE.

The mineral aggregate shall consist of any suitable mineral matter, either sand or fine crushed stone, or a combination of both, graded as follows:

Portland cement or stone dust passing a No. 200 sieve.....	10.0 to 15.0%
Mineral aggregate passing a No. 80 sieve.....	18.0 to 36.0%
Mineral aggregate passing a No. 40 sieve.....	20.0 to 50.0%
Mineral aggregate passing a No. 10 sieve.....	8.0 to 25.0%
Mineral aggregate passing a No. 4 sieve.....	up to 10.0%

With this fine graded aggregate shall be used a proportion of crushed stone all of which will pass a $\frac{1}{2}$ inch screen and be retained on a 1-10 inch screen amounting to approximately 25.0% of the whole aggregate.

The item designated as "Portland cement or stone dust passing a No. 200 sieve" within the limits named herein, includes in addition to the Portland cement or stone dust fine sand passing a No. 200 sieve not exceeding 5 per cent of the total mixture, and such 200 mesh mineral dust naturally self-contained in the refined asphalt.

As an alternative to the above specified grading the following, commonly known as the "Topeka Specifications," may be used, which produces a cheaper mixture but which may be successfully used on suburban streets and highways.

- Mineral aggregate passing 200 mesh screen, from 5 to 11%.
- Mineral aggregate passing 40 mesh screen, from 18 to 30%.
- Mineral aggregate passing 10 mesh screen, from 25 to 55%.
- Mineral aggregate passing 4 mesh screen, from 8 to 22%.
- Mineral aggregate passing 2 mesh screen, less than 10%.

Sieves to be used in the order named.

BITUMINOUS CEMENT.

To the mineral aggregate shall be added from 8 per cent to 10 per cent by weight of bituminous cement of the grades provided in paragraphs below.

MIXING AND LAYING.

The mixing and laying shall be done as provided in Specification X, except that no seal or flush coat shall be used.

ASPHALTIC CEMENT.

FOR BOTH SPECIFICATIONS X AND Y.

The asphaltic cement may be prepared from the following asphalts combined with flux as hereinafter specified, if flux is necessary: (1) From refined natural asphalt; (2) from the residue obtained in the careful distillation either with or without oxidation of asphaltic or semi-asphaltic petroleum; (3) from any uniform combination of the preceding materials together with a suitable flux, if flux be necessary, such combination being subject to the approval of the Engineer.

Each bidder must state the nature and origin of the bitumen to be used by him, and further, shall submit samples of the bituminous cement with his proposal.

The asphaltic cement shall pass the requirements designated below:

(1) It shall have a penetration of from 40 to 80 at 77 degrees F., depending upon the traffic and climatic conditions and hardness of the pavement desired. A penetration of from 40 to 50 in most cements will produce a hard, exceedingly stable pavement which should be used on streets subjected to constant or heavy traffic.

A penetration of from 50 to 65 in most cements will produce a pavement best calculated to meet general traffic conditions. The above penetrations are measured in hundredths centimeters with a No. 2 needle weighted with 100 grams acting for 5 seconds.

(2) When 50 grams of the cement are maintained at a temperature of 325 degrees F. for five hours in a tin box $2\frac{1}{4}$ inches in diameter by $1\frac{3}{4}$ inches deep, there must not be volatilization of more than 3 per cent by weight of the bitumen present nor shall the original penetration be reduced thereby over one-half.

(3) The bitumen of the asphaltic cement shall yield upon ignition not more than 15 per cent of fixed carbon for asphaltic cement of penetration between 65 and 80 and not more than $16\frac{1}{2}$ per cent for asphaltic cement between 40 and 65.

The method of test employed is that recommended by the Committee on Coal Analysis of the American Chemical Society.

(4) Of the bitumen of the asphaltic cement which is soluble in carbon disulphide $98\frac{1}{2}$ per cent shall be soluble in carbon tetrachloride. In this test for carbenes the asphaltic cement to be tested should be allowed to stand over night, covered with purified carbon tetrachloride. The test to be performed in subdued light.

(5) At 32 degrees F. the bitumen of the cement shall have a penetration of not less than 8 when tested one minute with the needle weighted to 200 grams.

(6) The cement shall not flash at a less temperature than 350 degrees F., New York State Closed Oil Tester.

FLUX.

The fluxing material may be a paraffine, a semi-asphaltic, or an asphaltic residuum which shall be tested with and found suitable to the asphalt to be used.

The residuum must have a penetration greater than 350 degrees with a No. 2 needle at 77 degrees F. under fifty grams weight for one second.

A natural maltha may be used if it passes the heat and flash tests specified under "a."

(a) The paraffine residuum shall have a specific gravity of 0.92 to 0.94 at 77 degrees F. It shall not flash below 350 degrees F. when tested in the New York State Closed Oil Tester, and shall not volatilize more than 5 per cent of material when heated five hours at 325 degrees F. in a tin box $2\frac{1}{4}$ inches in diameter by $1\frac{3}{4}$ inches deep, as officially prescribed.

(b) Semi-asphaltic residuum shall have the same general characteristics as paraffine residuum except that it shall have a specific gravity of 0.94 to 0.98 at 77 degrees F.

(c) Asphaltic residuum shall have the same general characteristics as paraffine residuum except that the specific gravity shall be not less than 0.98 nor more than 1.04 at 77 degrees F.

COAL TAR CEMENT.

The coal tar cement shall be residue of the distillation of coal tar only, and shall be refined for the special purpose of making a paving cement.

No mixture of hard pitch with the lighter oils of coal tar will be permitted.

Its specific gravity shall be not less than 1.20 nor more than 1.29 at 60 degrees F.

The melting point determined by the cube method shall be not less than 100 degrees F. and not more than 115 degrees F.

It shall contain not less than 15 per cent nor more than 30 per cent of free carbon insoluble in benzol.

It shall be free from water as determined by distillation and shall show upon ignition not more than $\frac{1}{2}$ per cent of inorganic matter.

No distillate shall be obtained lower than 338 degrees F. and up to 600 degrees not less than 5 per cent and not more than 20 per cent of distillate shall be obtained. The distillate shall be of a gravity of not less than 1.03 at 60 degrees F. The residue shall have a melting point of not more than 165 degrees F. In making this distillation an 8 ounce glass retort shall be used and the thermometer suspended so that before applying the heat the bulb of the thermometer is $\frac{1}{2}$ inch above the surface of the liquid. The melting point of the pitch shall be determined by suspending a $\frac{1}{2}$ inch cube in a beaker of water one inch above the bottom. The temperature shall be raised 9 degrees per minute from 60 degrees F. The temperature recorded the instant the pitch touches the bottom shall be considered the melting point of the pitch. In testing the original materials the initial temperature shall be 40 degrees F.

WATER GAS TAR CEMENT.

1. The specific gravity at 25 degrees C. shall be between 1.155 and 1.170.

2. On extraction with cold carbon disulphide at room temperature for 20 minutes not less than 97½% shall be soluble.

3. When tested in a penetrometer at 25 degrees C. with a No. 2 needle under 100 grams load for five seconds, it shall have a penetration of not less than 27.5 m.m. and not more than 32.5 m.m.

4. When 100 c.m. are distilled in a 250 c.c. Engler flask according to the method proposed by the American Society for Testing Materials, it shall lose the following fractions by weight:

From start to 170° C.....	0.
170 to 225° C.....	not over ½%.
225 to 270° C.....	from 2 to 6%.
270 to 300° C.....	from 5 to 9%.
Residue	not less than 84%.

MAINTENANCE BOND.

Your Committee on Bituminous Concrete recommends with reference to Maintenance Bond that where a municipality desires a Maintenance Bond it shall be made for the period of from three to five years, the longer period to apply to the heavier class of construction.

LINN WHITE, Chairman,
Chief Engineer, South Park Commissioners, Chicago.

E. A. KINGSLEY, Vice Chairman,
County Highway Engineer, Pulaski
County, Little Rock, Ark.

J. H. WEINBERGER,
Engineer in Charge of Highways, Borough
of Queens, New York City.

WILLIAM H. CONNELL,
Chief, Bureau of Highways and Street
Cleaning, Philadelphia, Pa.

W. L. HEMPELMANN,
Engineer, Bituminous Roadways,
St. Louis, Mo.

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PRESIDENT HARDEE: Will Mr. Allen, Chairman of the Committee on Bonds and Guarantees, present his report?

MR. ALLEN: (Reads report.)
I move its adoption.

VICE-PRESIDENT TONSON (in the Chair): Gentlemen, you have heard the report. It is moved and seconded that it be adopted as read. Any remarks?

MR. MACGREGOR: I was not sure whether there was any provision in the report for the retention of money in addition to the bond.

MR. ALLEN: There is no provision in the report except the maintenance or guarantee to be sustained by bond. The matter was discussed, some of the members will remember, at the meeting in Chicago. Of course there can be no objection on anybody's part, it seems to me, if the guarantee is in the form of a cash retainer rather than a bond. It is a matter of preference so far as the local parties are concerned.

MR. MACGREGOR: I had in mind the retention of money in addition to a bond. I think a great many engineers will agree with me that money in hand is a good deal better than a bond and most of us have had experience, I am sure, with cases where the bond was found to be worthless from a practical point. Speaking for New York City, we retain some money on practically all pavements, on which we get a guarantee. On some pavements money

has not been retained, but I think that many will agree with me in saying that an amount of money retained is better than a bond, and the two together may be better still.

MR. ALLEN: Does the gentleman have reference to guarantees for five years or more than five years?

MR. MACGREGOR: Five years, which is a long enough guarantee period.

MR. ALLEN: Of course, if it is five years it is one thing, and if it is ten years it is another, because in most cases in my knowledge where it seems to be necessary to guarantee pavements, they last five years without the need of money to make repairs, and therefore the retention of money for that particular purpose would be simply hiding money away where it cannot be used. This from a standpoint of economy and general welfare would be objectionable.

MR. MACGREGOR: We retain money on a granite pavement with one-year guarantee and find the money useful.

VICE-PRESIDENT TONSON: Any further comments on this specification?

MR. BABCOCK: I know something about the guarantee proposition. I believe that the criticism was made on the committee's work last year along the line that it did not specify in its report exactly what the guarantee should be for the different kinds of pavements. All you have to do is to recommend what you consider wise in the way of guarantee or the retention of an amount of money on the contract. I really believe that the whole trouble with our guarantee has been that we have not defined well enough in our contracts the condition of the pavements during the term of the guarantee or its condition at the end of the term of guarantee. The engineers do not get together about the condition of the pavements at the expiration of the guarantee. We do not define well enough where the contractor gets out and where the bond comes in.

VICE-PRESIDENT TONSON: My understanding is that the condition of the pavement at the time of the guarantee is a matter to be determined locally. Was this considered, Mr. Chairman?

MR. ALLEN: The recommendation of the report is that each one of the committees engaged in the business of preparing specifications for the various kinds of pavements should state, as a part of the specifications, the condition in which a pavement should be during the period of its guarantee; if it is one that should be guaranteed, and at the end; but it is no part of the business of this Committee on Bonds and Guarantees to state just what those conditions should be. However, we believe it is the business and

an important point in connection with the work of the other committees to state and make a specification for the condition of the pavement during the period of its guarantee and at the end of the guarantee so as to make some definite rule for the acceptance of pavements by the officials of the various cities.

MR. TILLSON: The question.

VICE-PRESIDENT TONSON: You have heard the question, gentlemen. All in favor will signify by saying "Aye"; contrary "No." Carried.

The following is the adopted

REPORT OF THE COMMITTEE
ON
BONDS AND GUARANTEES.

Pittsburgh, Pa., February 25, 1913.

The Committee on Bonds and Guarantees has carefully reviewed the reports made at the several previous meetings of the Association and begs leave to report that it has nothing more to add upon the subject.

Its conclusions may be summed up briefly as follows:

1. That pavements of perishable nature, or composed of new and untried materials or combinations thereof, should be guaranteed for a sufficient length of time to prove their worth. In the opinion of the Committee there is no need, so far as the practical matter of guarantee of the standard pavements of this nature in use is concerned, to require a longer period than five years for this purpose.

Where there is no legal inhibition and the desire exists that provision for maintenance for a certain period be made at the time the pavement is laid, no objection that may be sustained can be raised provided the certainty of obtaining the prepaid service is secured or payment for maintenance be separated from the construction cost.

2. There seems to be no good reason for guaranteeing for any period, pavements composed of materials of stable and imperishable nature. Neither can objection be made in this class of pavements to a provision for their maintenance for a definite period if the law will permit and the parties who pay are contented.

The Committee has heretofore recommended and desires finally to recommend that the period of guarantee in this class of pavements be one year.

The situation so far as bonds to secure the terms of a guaranty are concerned, remains, so far as we are able to learn, the same as heretofore. The Bonding Companies refuse to furnish bonds to secure guaranty and maintenance for a period longer than five years, and even if it is desirable from a practical standpoint to provide for ten or more years of maintenance it is doubtful if the payment in advance without

sufficient security of money to be used through a period of years for purposes of repair is sufficiently wise or conservative where the public's money is concerned.

In the matter of the form of the bond, we again recommend the provision suggested in our last report:

1. Requirement in general specifications that the guarantee bond be furnished at the time of the execution of the contract.

2. A simple form of bond requiring compliance with the terms of the specifications.

3. A fair and full definition of the relative rights and obligations of both parties to the contract as to openings and unusual conditions, so that both may know their rights.

4. In the specifications for each particular pavement, so far as practicable, a full definition of the condition in which the pavement must remain during, and be in, at the expiration of the guaranty period. That such definition should be based upon measurable or definable irregularities in wear, and not upon uniform or general wear, together with a limitation of the amount of repairs during the period of guaranty, beyond which limitation necessary repairs shall be deemed to indicate a total failure requiring entire renewal within specified areas.

Respectfully submitted,

HENRY C. ALLEN, Chairman,
City Engineer, Syracuse, N. Y.

CHARLES L. HUTCHINSON,
Member Board of Public Works, Indianapolis, Ind.

CHARLES E. NORTON,
Member Board of Public Works, Grand Rapids, Mich.

DR. C. F. KRAEMER,
Commissioner Streets and Water,
Newark, N. J.

For information, the following is the report of the Committee on BONDS AND GUARANTEES adopted at New Orleans, La., January 11, 1912.

Our report is founded on the theory that there is a difference between "Guaranty" and "Maintenance," and that we are authorized by the Association to consider only the "guaranty" phase, and the bond or other surety for securing the faithful execution of this part of the contract.

Cities which contemplate including in an original contract, provision for making repairs during some period exceeding that of guaranty, are advised that the report does not deal with the situation.

We have considered only the matter of guaranty, by which we mean that the Contractor warrants or guarantees that the pavement, when laid with the best of workmanship and material, will endure without repairs for a certain period; viz., that period usually designated as "maintenance" in contracts.

In order to cover a contingency that during this period of guaranty, the pavement may become out of condition through any reason other than an unexpected or an un contemplated disturbance, there is recommended a description to be included in a specification of what constitutes "serviceable condition" during the period of guaranty and upon its termination, together with suitable provision for correcting defects by the city in the case of the Contractor's default.

Your Committee has reviewed the work of previous committees of the Association and further discussed recent developments of the questions involved. Generally speaking, the findings of the previous committees are concurred in, and it is mainly matters of amendment and detail upon which we desire to report and make recommendations.

The gist of the first report at Chicago was the recommendation that pavements of a perishable nature should be guaranteed for a period of five (5) years, and others of a more permanent character need not be guaranteed for more than one (1) year. In the latter class were included vitrified brick pavements. With respect to these, we feel that there would be better assurance of obtaining the best results without additional expense, if such contracts carried a guarantee for five (5) years, and we therefore recommended that in contracting for brick pavements, a provision be required that they be maintained for such a period.

The second report, that of the New York meeting found that after meetings and correspondence, a number of Bonding Companies were apparently willing to forego the doing of any business based upon pavement guarantee, and declined to write ten (10) year bonds under any circumstances. However, in the interest of ensuring for the public the best that may be obtained, this Committee is still of the mind that a guarantee for such length of time as a pavement laid with the best of workmanship and materials will last without repairs, should be exacted in contracting for pavements.

It believes, however, that there should be a specification included in the contract which shall describe the condition in which a pavement shall remain during the period of guaranty, and also in what condition it should be at the termination of the guaranty period. We are not prepared to recommend the terms of this specification, and respectfully refer consideration of the same to the several committees on pavement specifications. We suggest, however, that the determination of the terms should be based upon practical examination of the actual conditions of numerous pavements of similar nature and age throughout the country.

Many of the cities, by reason of charter requirements, cannot legally introduce into any contract a provision which will result in the charging of any of the cost of maintenance upon the local property owners, since such cost is by law a charge upon the city at large.

We think, therefore, that there should be a differentiation between the terms "guarantee" and "maintenance" and that provision of the contract relative to each should be made separate and distinct, if main-

tenance is to be considered. Provision for maintenance need not be made if a period longer than five (5) years is to be exacted, since it has been fairly well demonstrated that any of the pavements now in common use, when properly made and laid, will last that long without repairs.

A description in a specification therefore, of what shall be deemed, during the guaranty period and at its termination, to be an inferior condition of the pavement requiring correction, together with sufficient power reserved to the city to make such correction in case of the contractor's failure to do so, seems to be all that is necessary in the premises.

The surety bond or cash reserve guaranteeing the execution of the terms of the contract and specification need be only of the usual simple form.

We append the following tentative provisions which we recommend to be included as the form to be generally followed.

1. Requirement in general specifications that the guarantee bond be furnished at the time of the execution of the contract.

2. A simple form of bond requiring compliance with the terms of the specifications.

3. A fair and full definition of the relative rights and obligations of both parties to the contract as to openings and unusual conditions, so that both may know their rights.

4. In the specifications for each particular pavement, so far as practicable, a full definition of the condition in which the pavement must remain during, and be in, at the expiration of the guaranty period. That such definition should be based upon measurable or definable irregularities in wear, and not upon uniform or general wear, together with a limitation of the amount of repairs during the period of guaranty, beyond which limitation necessary repairs shall be deemed to indicate a total failure requiring entire renewal within specified areas.

Your Committee has not at hand sufficient definite information to make recommendations, but submits a section to be inserted under No. 3 above, and an outline of definition applicable under No. 4, for determining fulfillment of the terms of guaranty applicable to one kind of pavement. We trust that sufficient information may be gathered in various cities along general lines suggested, to make possible a definition of irregularities in a pavement at the expiration of guarantee, which shall be a just and practicable measure of the obligation assumed under a bond or cash retainer.

We recommend that the form followed be, in the general specifications, a provision for furnishing a guarantee bond at the time of execution of the contract, and a simple form of bond which requires compliance with the terms of the specifications.

Following are suggestions of the matter which may be inserted under Nos. 3 and 4 above referred to.

3. The Contractor shall have the right to replace the pavement wherever cut or disturbed by others, and shall receive therefor a compensation as follows: (make rate per yard for repairs, less than 5 yards, 5 yards to 25 yards, 25 yards to 100 yards, and above 100 yards for the

kind of payment. Such might be from 25% to 60% above the contract rate.) And in addition the actual cost of replacing improper back filling.

The city shall have the right to open the pavement for its own purposes and to grant permission in case of emergency endangering public health or safety. In such cases the city shall pay the Contractor as above.

The Contractor shall give consent to open this pavement to those lawfully entitled to do so, upon such reasonable restrictions as will ensure the payments above specified. In case the Contractor is not in the city or has no local representative or refuses such consent then the city may grant permission.

Whenever the city opens or grants permission to open it shall forthwith notify the Contractor, when the trench is fit to repave, to repave such opening.

The Contractor shall within ——— days of the date of such notice or of the date any area for which he has given consent, is ready, repave such opening with the kind of pavement herein specified. In default of the Contractor to make such repairs within the specified time, the period from ——— to ——— excepted, the city may make such repairs either in full or in part, but the Contractor shall be in no wise relieved of his obligations because of such repair having been made by the city.

Where any cut or opening made in this pavement in any block shall exceed —% of the surface of the pavement in such block, then the guarantee as to that part disturbed by such opening shall terminate, and when such cut or opening shall exceed —% of such area, then the guarantee shall terminate as to such block.

In case of the construction of a surface street railroad longitudinally in this pavement, the remaining period of guarantee for the space occupied by tracks shall terminate; and for the part not disturbed, the remaining period of guarantee shall be reduced by one third (1-3) for a single track, and one half ($\frac{1}{2}$) for a double track, within the longitudinal extent of such tracks. For crossings, curbs, and switches, guarantee shall terminate for the area disturbed only.

4. Conditions of acceptance of asphalt pavements as for filling the terms of the guaranty; it shall not have more than ——— lineal feet of cracks in each 100 square yards of surface. All cracks exceeding ——— in width shall be deemed disintegration. The surface shall not hold water to a greater depth than ——— inch. It shall not vary more than ——— from a straight edge of ——— feet long, applied in the direction of the length of the street. It shall not vary more than ——— from a template cut to the original crown of the street. All disintegrated parts shall be removed. When, during guaranteed period more than —% of the surface in any 300 lineal feet of street, shall have been repaired, it shall be deemed a failure of such 300 feet, which shall be resurfaced for acceptance.

Methods of measurements and extent of unequal wear for other pavements are recommended to be along lines similar to those proposed above, and include such additional limitations as are applicable to its kind.

VICE PRES. TONSON (in the Chair): I will now call for the report of the Committee on Brick Paving Specifications, Mr. Christ, Chairman.

MR. CHRIST: (Reads report). I move its adoption.

VICE PRES. TONSON: You have heard the report of the Committee, gentlemen. It has been moved and seconded that it be adopted. Are you ready for the question?

The question.

VICE PRES. TONSON: All in favor of the adoption of the report will signify by saying "Aye"; contrary "No." Carried.

The following is the adopted:

REPORT OF THE COMMITTEE ON BRICK PAVING SPECIFICATIONS.

Pittsburgh, Pa., February 26, 1913.

To the President and Members of the
Association for Standardizing
Paving Specifications.

Your Committee on Brick Paving Specifications, after having carefully considered all criticisms and suggestions submitted to us, beg leave to report that no changes be made in the Specifications, as adopted by this Association at the New Orleans Convention, January, 1912.

We, however, have the following recommendations to make:

Mr. Kershaw of The Texas Company and Mr. Forrest of The Barber Asphalt Company appeared before the Committee, requesting modification of Section 24 of the 1912 Specifications to read as follows: "No. 2 Needle, 1 min. 200 grams, at 32 deg. F. not below 12." Inasmuch as these Specifications were adopted after mature deliberation, the Committee does not deem it advisable to make the change at the present time.

The Committee has under serious consideration, with the view of securing uniformity, the question of a minimum as well as a maximum loss by abrasion, looking forward to fixing at some future time an allowable variation.

While these subjects have been discussed, the Committee is not prepared at this time, sufficient data not being available, to definitely determine upon the modification and fix the requirements, and would suggest that the Members of this Association investigate the subjects and send the results of their tests to the Chairman of this Committee.

EDWARD H. CHRIST, Chairman,
Consulting Eng., Grand Rapids, Mich.

H. A. KLAUSMANN, Vice Chairman,
City Engineer, Indianapolis, Ind.

H. VANDEWATER,
Assistant Engineer, Buffalo, N. Y.

GAYLORD C. CUMMIN,
City Engineer, Dayton, Ohio.

CHAS. M. REPPERT,
Division Engineer, Bureau of Construction, Pittsburgh, Pa.

A. LENDERINK, City Eng., Kalamazoo, Mich.

For information, the following is the report of the Committee on Brick Paving Specifications adopted at New Orleans, La., January 11, 1912:

Your Committee on Vitrified Brick after having carefully considered all criticisms and suggestions submitted to us beg leave to report the following specifications:

PART I. THE BRICK.

CHARACTER OF BRICK.

SECTION 1. All brick must be strictly No. 1 pavers of the sizes commercially known as "vitrified block" and "brick," the widths of which must not vary more than one-eighth ($\frac{1}{8}$) of an inch. They must be thoroughly annealed, tough and durable, regular in size, shape and evenly burned.

When broken, the brick shall show a dense, stone-like body, free from lime, air pockets, cracks or marked laminations. Kiln marks must not exceed three-sixteenths ($\frac{3}{16}$) of an inch, and one edge at least shall show but slight kiln marks. All bricks so distorted in burning as to lay unevenly in the pavement shall be rejected.

The standard size of brick shall be two and one-half ($2\frac{1}{2}$) inches in width, four (4) inches in depth and eight and one-half ($8\frac{1}{2}$) inches in length; and the standard size of block three and one-half ($3\frac{1}{2}$) inches in width, four (4) inches in depth, and eight and one-half ($8\frac{1}{2}$) inches in length. They shall not vary from these dimensions to exceed one-eighth ($\frac{1}{8}$) of an inch in width and depth, and not more than one-half ($\frac{1}{2}$) inch in length. If the edges of the brick are rounded, the radius shall not exceed three-sixteenths ($\frac{3}{16}$) of an inch. Only brick with raised lugs on one side not to exceed one-fourth ($\frac{1}{4}$) inch in height shall be used.

Whenever the word "brick" is used in these specifications it is intended to refer to either brick or block, whichever may be used, except in the one instance noted at the end of Section 4.

BRICK PAVEMENT SPECIFICATIONS.

INSPECTION.

SEC. 2. All brick shall be subject to thorough inspection before and after laying and rolling, and all rejected material shall be immediately removed from the street.

DELIVERY OF BRICK.

SEC. 3. The brick shall be hauled, carefully unloaded by hand, and neatly piled on the walks or outside of the curbs before the grading is finished, and in laying shall be carried from there to the pavement.

RATTLER TEST FOR BLOCK SIZE.

SEC. 4. The brick shall not lose of their weight more than 22% after being submitted to the following tests:

Samples of brick of uniform shape and appearance shall be taken from each car (estimated at 10,000 brick). Brick having a defect that would cull them shall not be used. Three grades of samples shall be tested, one of the softest, one of the medium, and one of the hardest burned. If all of the tests overrun the above percentage of loss, the car shall be rejected. If one or two of the tests overrun, another test of said grade or grades shall be made. Should only one of these tests overrun the specified percentage of loss, the contractor may cull said grade, provided they do not exceed ten (10) per cent of the amount of brick in the car, and deliver the balance on the improvement. Otherwise, the whole car will be rejected.

In order to prevent the continued shipments of inferior brick, only two cars of two separate shipments of any make of brick will be tested. Should they fail to meet the requirements stated above, said make of brick will be rejected for this improvement.

(NOTE: Inasmuch as your Committee have not made any tests of the brick size, we are not prepared to recommend specific abrasion loss for that size.)

Where medium or light traffic, or other conditions exist, which, in the opinion of the Engineer, do not require a brick sufficient to stand an abrasive loss of 22%, brick of quality sufficient to stand a loss of 25% or even 28% may be used.

NUMBER AND CONDITION OF BRICK.

SEC. 5. Ten paving brick shall constitute the number to be used in a single test. The brick shall be thoroughly dried for at least three (3) hours, in a temperature of one hundred (100) degrees Fahr. before testing.

TESTS BEFORE UNLOADING.

SEC. 6. The contractor shall notify the proper city official of the location and car number of each carload of brick received. Samples from such car shall be taken and tested by the city, and no brick shall be delivered on or adjacent to any improvement on which the brick are to be used until a written statement has been received from the Engineer or his authorized representative, that the samples have passed the required tests. Decision relative to each carload will be made within twenty-four (24) hours of notice. Permission to deliver brick on the line of work shall not be considered a final acceptance in any respect.

MAKING THE RATTLER TEST.

SEC. 7. *The Rattler*—The machine shall be of good mechanical construction, self-contained, and shall conform to the following details of material and dimensions, and shall consist of barrel, frame and driving mechanism as herein described.

The Barrel—The barrel of the machine shall be made up of the heads, headliners and staves.

The heads shall be cast with trunnions in one piece. The trunnion bearings shall not be less than two and one-half ($2\frac{1}{2}$) inches in diameter or less than six (6) inches in length.

The heads shall not be less than three-fourths ($\frac{3}{4}$) inch thick nor more than seven-eighths ($\frac{7}{8}$) inch. In outline they shall be a regular

fourteen-sided (14) polygon inscribed in a circle twenty-eight and three-eighths ($28\frac{3}{8}$) inches in diameter. The heads shall be provided with flanges not less than three-fourths ($\frac{3}{4}$) inch thick and extending outward two and one-half ($2\frac{1}{2}$) inches from the inside face of head to afford a means of fastening the staves. The flanges shall be slotted on the outer edge, so as to provide for two (2) three-fourths ($\frac{3}{4}$) inch bolts at each end of each stave, said slots to be thirteen-sixteenths ($\frac{13}{16}$) inch wide and two and three-fourths ($2\frac{3}{4}$) inches center to center. Under each section of the flanges there shall be a brace three-eighths ($\frac{3}{8}$) inch thick and extending down the outside of the head not less than two (2) inches. Each slot shall be provided with recess for bolt head, which shall act to prevent the turning of the same. There shall be for each head a cast iron headliner one (1) inch in thickness and conforming to the outline of the head, but inscribed in a circle twenty-eight and one-eighth ($28\frac{1}{8}$) inches in diameter. This liner or wear plate shall be fastened to the head by seven (7) five-eighths ($\frac{5}{8}$) inch cap screws, through the head from the outside. These wear plates, whenever they become worn down one-half ($\frac{1}{2}$) inch below their initial surface level, at any point of their surface, must be replaced with new. The metal of which these wear plates are to be composed shall be of what is known as hard machinery iron, and must contain not less than one (1) per cent of combined carbon. The faces of the polygon must be smooth and give uniform bearing for the staves. To secure the desired uniform bearing the faces of the head may be ground or machined.

The Staves—The staves shall be made of six (6) inch medium steel structural channels twenty-seven and one-fourth ($27\frac{1}{4}$) inches long and weighing fifteen and five-tenths (15.5) pounds per lineal foot.

The channels shall be drilled with holes thirteen-sixteenths ($\frac{13}{16}$) inch in diameter, two (2) in each end, for bolts to fasten same to head, the center line of the holes being one (1) inch from either end and one and three-eighths ($1\frac{3}{8}$) inches either way from the longitudinal center line.

The spaces between the staves will be determined by the accuracy of the heads, but must not exceed five-sixteenths ($\frac{5}{16}$) inch. The interior or flat side of each channel must be protected by a lining or wear plate three-eighths ($\frac{3}{8}$) inch thick by five and one-half ($5\frac{1}{2}$) inches wide by nineteen and three-fourths ($19\frac{3}{4}$) inches long. The wear plate shall consist of medium steel plate, and shall be riveted to the channel by three (3) one-half ($\frac{1}{2}$) inch rivets, one of which shall be on the center line both ways and the other two on the longitudinal center line and spaced seven (7) inches from the center each way. The rivet holes shall be counter-sunk on the face of the wear plate and the rivets shall be driven hot and chipped off flush with the surface of the wear plate. These wear plates shall be inspected from time to time, and if found loose shall be at once re-riveted, but no wear plate shall be replaced by a new one except as the whole set is changed. No set of wear plates shall be used for more than one hundred and fifty (150) tests under any circumstances. The record must show the date when each set of wear plates goes into service and the number of tests made upon each set.

The staves when bolted to the heads shall form a barrel twenty (20) inches long, inside measurement, between wear plates. The wear plates

of the staves must be so placed as to drop between the wear plates of the heads. The staves shall be bolted tightly to the heads by four (4) three-fourths ($\frac{3}{4}$) inch bolts, and each bolt shall be provided with lock nuts, and shall be inspected at not less frequent intervals than every fifth (5th) test and all nuts kept tight. A record shall be made after each such inspection, showing in what condition the bolts were found.

The Frame and Driving Mechanism—The barrel shall be mounted on a cast-iron frame of sufficient strength and rigidity to support same without undue vibration. This shall rest on a rigid foundation and be fastened to same by bolts at not less than four (4) points.

It shall be driven by gearing whose ratio of driver to driven shall not be less than one (1) to four (4). The counter shaft upon which the driving pinion is mounted shall not be less than one and fifteen-sixteenths ($1\frac{15}{16}$) inches in diameter, with bearings not less than six (6) inches in length and belt driven, and the pulley shall not be less than eighteen (18) inches in diameter and six and one-half ($6\frac{1}{2}$) inches in face. A belt of six (6) inch double-strength leather, properly adjusted so as to avoid unnecessary slipping shall be used.

THE ABRASIVE CHARGE.

SEC. 8. (a) The abrasive charge shall consist of two sizes of cast-iron spheres. The larger size shall be three and seventy-five hundredths (3.75) inches in diameter when new and shall weigh when new approximately seven and five-tenths (7.5) pounds (3.40 kilos) each. Ten shall be used.

These shall be weighed separately after each ten (10) tests, and if the weight of any large shot falls to seven (7) pounds (3.175 kilos) it shall be discarded and a new one substituted; provided, however, that all of the large shot shall not be discarded and substituted by new ones at any single time, and that so far as possible the large shots shall compose a graduated series in various stages of wear.

The smaller size spheres shall be, when new, one and eight hundred seventy-five thousandths (1.875) inches in diameter and shall weigh not to exceed ninety-five hundredths (.95) pounds (0.430 kilos) each. Of these spheres so many shall be used as will bring the collective weight of the large and small spheres most nearly to three hundred (300) pounds, provided that no small sphere shall be retained in use after it has been worn down so that it will pass a circular hole one and seventy-five hundredths (1.75) inches in diameter, drilled in cast-iron plate one-fourth ($\frac{1}{4}$) inch in thickness, or weigh less than seventy-five hundredths (.75) pound (or .34 kilos). Further, the small spheres shall be tested after every ten (10) tests, by passing them over such an iron plate drilled with such holes, or by weighing, and any which pass through or fall below the specified weight shall be replaced by new spheres; provided, further, that all of the small spheres shall not be rejected, and replaced by new ones at any one time, and that so far as possible the small spheres shall compose a graduated series in various stages of wear. If at any time any sphere is found to be broken or defective it shall at once be replaced.

(b) The iron composing these spheres shall have a chemical composition within the following limits:

Combined carbon—Not less than 2.50%.

Graphite carbon—Not more than 0.10%.

Silicon—Not more than 1%.

Manganese—Not more than 0.50%.

Phosphorus—Not more than 0.25%.

Sulphur—Not more than 0.08%.

For each new batch of spheres used the chemical analysis must be furnished by the maker, or be obtained by the user, before introduction into the charge; and unless the analysis meets the above specifications, the batch of spheres shall be rejected.

THE TEST.

SEC. 9. The rattler shall be rotated at a rate of not less than $29\frac{1}{2}$ nor more than $30\frac{1}{2}$ revolutions per minute, and 1,800 revolutions shall constitute the standard test. A counting machine shall be attached to the rattler for counting the revolutions.

A margin of not to exceed ten (10) revolutions will be allowed for stopping. In case a charge is allowed to run several minutes beyond its proper termination, and the loss incurred is still within the prescribed limits, then the test shall not be discarded, but the fact shall be entered on the record.

Stopping and Starting—Only one (1) start and stop per test is regular and acceptable. If from accidental causes a test is stopped and started twice extra, and the loss exceeds the maximum permissible, the test shall be disqualified and another made.

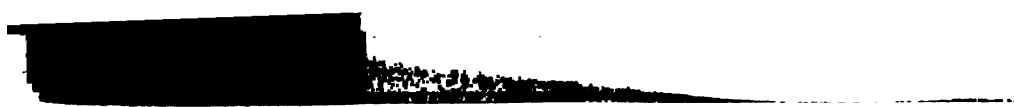
THE RESULTS.

SEC. 10. The loss shall be calculated in percentage of the original weight of the dried brick composing the charge. In weighing the rattled brick, any piece weighing less than one (1) pound shall be rejected.

THE RECORD.

SEC. 11. *Description*—The operator shall keep an official book, in which the alternate pages are perforated for removal. The record shall be kept in duplicate, by use of a carbon paper between the first and second sheets, and when all entries are made and calculations are completed, the original record shall be removed and the carbon duplicate preserved in the book. All calculations must be made in the space left for that purpose in the record blank, and the actual figures must appear. The record must bear its serial number and be filled out completely for each test and all data as to dates of inspections, weighing of shot, and replacement of worn-out parts must be carefully entered, so that the records remaining in the book constitute a continuous one. In event of further copies of a record being needed, they may be furnished on separate sheets, but in no case shall the original carbon copy be removed from the record book.

The blank form upon which the record of all official brick tests is to be kept and reported is as follows:



1. The first part of the document is a list of names and addresses of the persons who have been named in the document.

2. The second part of the document is a list of names and addresses of the persons who have been named in the document.

3. The third part of the document is a list of names and addresses of the persons who have been named in the document.

4. The fourth part of the document is a list of names and addresses of the persons who have been named in the document.

5. The fifth part of the document is a list of names and addresses of the persons who have been named in the document.

6. The sixth part of the document is a list of names and addresses of the persons who have been named in the document.



REPORT OF STANDARD RATTLER TEST OF PAVING BRICKS.

IDENTIFICATION DATA (SERIAL NO. —)

Name of firm furnishing sample.....
 Name of the firm manufacturing sample.....
 Street or job which sample represents.....
 Brands or marks on the brick.....
 Quantity furnished.....Drying treatment.....
 Date received.....Date tested.....
 LengthBreadthThickness

STANDARDIZATION DATA.

Number of charges tested since last inspection.....
 Weight of charge (after standardization).....
 Condition of Locknuts on Staves.....
 Condition of scales.....

BRICK PAVEMENT SPECIFICATIONS.

10 large spheres
 small spheres
 Total.....
 Number of charges tested since stave linings were renewed.....
 Repairs (Note any repairs affecting the condition of the barrel).....

RUNNING DATA.

	Time Readings.	Revolution.	Running Notes,
	Counter Readings.	Stops, etc.,	
	Hours.	Minutes.	Seconds.
Beginning of test.....			
Final reading			

WEIGHTS AND CALCULATIONS.

Initial weight of 10 bricks.....
 Final weight of same.....
 Loss of weight.....Percentage loss.....
 (Note: The calculations must appear.)

.....
 Number of broken bricks and remarks on same.....
 I certify that the foregoing test was made under the specifications of
and is a true record.

Signature of Tester.....
 Date.....Location of Laboratory.....

FOUNDATION.

SEC. 12. All brick shall be laid on a six (6) inch concrete base with sand cushion. The concrete base shall be constructed in accordance

with the materials and methods described in the specifications reported by the committee on cement concrete and adopted January, 1912.

SAND CUSHION.

SEC. 13. Over the foundation, which must be thoroughly cleaned, shall be spread to a uniform depth of one and one-half ($1\frac{1}{2}$) inches (after rolling), a cushion of clean, sharp sand, free from loam or foreign matter. The sand must pass a one-quarter ($\frac{1}{4}$) inch screen.

The cushion shall be carefully shaped to a true cross section of the roadway by means of a template having a steel faced edge, covering at least one-half ($\frac{1}{2}$) the width of the brick work, and so fitted with rollers as to be easily drawn on the curb and guide timbers or rail.

SEC. 14. *Template*—The template shall be built in substantial accordance with the plan accompanying these specifications.

SEC. 15. *Guide Timbers*—Guide Timbers shall be one and one-half ($1\frac{1}{2}$) inches by four (4) inches by sixteen (16) feet, dressed on two sides, laid to a true surface in the center of the street, and also next to the curb if the curb cannot be used.

SEC. 16. *Shaping Cushion*—Before shaping the cushion a one-half ($\frac{1}{2}$) inch strip shall be laid on the curb, and guide timbers, or rail, and the template drawn over the same, after which the one-half ($\frac{1}{2}$) inch strip shall be removed, the cushion slightly moistened and rolled over its entire surface with a hand roller. The roller shall be not less than thirty-six (36) inches in diameter, twenty-four (24) inches in width, and shall weigh not less than ten (10) pounds per inch in width, and have a handle twelve (12) feet in length. After rolling, the template shall be drawn over the curb and guide timber or rail, to complete the cushion. The cushion shall be prepared at least fifty (50) feet in advance of the brick laying.

LAYING THE BRICK.

SEC. 17. The brick shall be laid in straight lines on edge, at right angles to the curb. At intersections they shall be laid as directed. Brick shall be laid with the lug sides all in the same direction. Brick must be placed close together both ends and sides, breaking joints at least three (3) inches. At every fourth course the brick shall be driven together to secure tight joints and straight courses, and all thick brick shall be removed. Brick shall be used with the best edge up.

When any section shall contain more than ten (10) per cent of culls, the brick shall be taken up and the cushion adjusted. Brick shall be laid from curb to curb, or car track to curb.

No bats or broken brick shall be used except at curbs or at street car tracks. Batting for closures shall immediately follow the laying.

Joints shall be cut square with the top and sides of the brick. All joints must be kept clean and open to the bottom until filled as specified.

STREET CAR TRACKS.

SEC. 18. Along the street car tracks the brick must not be laid within one-quarter ($\frac{1}{4}$) of an inch of the rail, and when rolled shall be one-quarter ($\frac{1}{4}$) inch below the top of the rail.

BRICK PAVEMENT SPECIFICATIONS.

The space between the web or rail and the brick shall be filled with cement mortar, consisting of two (2) parts sand and one (1) part Portland cement. The mortar shall be in proper condition and the edge constructed to a straight line before the brick are laid.

EXPANSION JOINTS FOR CEMENT GROUT FILLER.

SEC. 19. Expansion joints shall be placed parallel with and at each of the curb lines, and shall be one and one-half ($1\frac{1}{2}$) inches in width. The joints shall be made by placing together on edge, parallel with the curb, two wedge-shaped strips six (6) inches in width, and dressed on two faces. The strip next to the curb shall be one (1) inch wide on top, beveled to a thickness of one-half ($\frac{1}{2}$) inch at the bottom, and the strip next to the brick shall be of the same dimensions and placed in a reverse position. The brick shall be laid lightly against said strips. Soon after the pavement has been grouted, and the cement filler has set, and the pavement is in all other respects finished, the strips shall be removed, the joints thoroughly cleaned out, and immediately completely filled with a bituminous filler composed of a material which, when penetrated by a No. 2 needle under a weight of 200 grammes for one (1) minute at a temperature of 32 degrees Fahr., will have a penetration of not less than 20, and when penetrated with a No. 2 needle under 50 grammes for five (5) seconds in a temperature of 115 degrees Fahr., will not have a penetration of over 100.

ROLLING.

SEC. 20. After the brick in the pavement have been passed for rolling and the surface swept clean, the pavement shall be rolled with a roller weighing not less than three (3) nor more than five (5) tons, in the following manner: The brick next the curb shall be tamped with a hard wood tamper, to the proper grade. The rolling shall then commence near the curb at a very slow pace, and continue back and forth toward the center, until the center of the street is reached; then, passing to the opposite curb, it shall be repeated in the same manner to the center of the street. After this first passing of roller the pace may be quickened and the rolling continued until each brick is firmly embedded in the sand cushion. The pavement shall then be rolled transversely at an angle of forty-five (45) degrees from curb to curb, repeating the rolling in the opposite forty-five (45) degree direction. Before and after this transverse rolling has taken place, all broken or injured brick must be taken up, and replaced with perfect ones. The substitute brick must be brought to the true surface by tamping.

After final rolling the pavement shall be tested with a ten (10) foot straight edge, laid parallel with the curb, and any depression exceeding one-quarter ($\frac{1}{4}$) of an inch must be taken out. If necessary, the pavement shall be again rolled.

PORTLAND CEMENT GROUT FILLER.

SEC. 21. The filler shall be composed of one part each of fine, clean, sharp sand and Portland cement. All cement used for this work must

stand the test as approved and adopted by the Association for Standardizing Paving Specifications, January, 1912.

The sand shall pass a No. 20 standard sieve. Sand shall be measured in a box having the same cubical contents as one sack of cement.

One sack of cement with an equal amount of sand shall be thoroughly mixed together dry in a box, preferably about four (4) feet eight (8) inches long, thirty (30) inches wide, and fourteen (14) inches deep, resting on legs of different lengths so that the mixture will rapidly flow to the lower corner of the box, the bottom of which shall be about three (3) inches above the pavement. One box shall be used for each fourteen (14) feet in width of roadway, and at least two (2) boxes must be used in all cases.

After the cement and sand have been thoroughly mixed until the mass assumes a uniform color, enough clean water shall be added to obtain a grout that will give the best results. From the time the water is applied until the last drop is removed, and floated into the joints of the pavement, the mixture must be kept in constant motion. Before the grout is applied the brick shall be thoroughly wet by being gently sprayed.

The grout shall be removed from the box with scoop shovels and applied to the brick in front of the sweepers, who shall rapidly sweep it lengthwise of the brick into the unfilled joints, until the joints are filled to within not more than one (1) inch of the top of the brick. After the grout has had a chance to settle into the joint and before the initial set develops, the balance of every joint shall be filled with a thicker grout, and, if necessary, refilled, until the joints remain full to the top.

After this application has had time to settle and before the initial set takes place, the pavement shall be finished to a smooth surface with a squeegee or wooden scraper, having a rubber edge, which shall be worked over the brick at an angle with the brick.

When completed and the cement has received its initial set, the pavement shall be covered with a one-half ($\frac{1}{2}$) inch layer of sand, which shall be frequently sprinkled in warm weather. No travel shall be permitted on the pavement for a period of at least seven (7) days after the grouting, or longer, as the Engineer may require on account of weather conditions.

Ample barricades and watchmen shall be provided by the contractor for the proper protection to the grouting.

(Note: While your Committee is in favor of a cement grout filler, we believe that where conditions do not favor the use of the same, for good and sufficient reasons, a bituminous filler may be used, for which we recommend the following specifications.)

COAL TAR PAVING PITCH FILLER.

SEC. 22. The joints or spaces between the bricks, and those between the bricks and the curb, railroad tracks, around manholes, etc., shall be filled with coal tar pitch, which shall comply with the following requirements:

Physical Properties—When in place in the pavement it shall be of character that it will adhere firmly to the paving brick and to the curb,

and shall be sufficiently plastic to allow for the contraction and expansion in the pavement without developing cracks in the joints. It shall be proof against action by water and all acids and alkalis to which the pavement may be exposed. The filler shall be such that it retain its consistency under extreme temperature.

The free carbon shall not be less than 25% nor more than 40%. The specific gravity shall not be less than 1.23 nor more than 1.30 at 60 degrees Fahr.

Melting Point—It shall have a melting point varying not more than 5 degrees from 135 degrees Fahr., determined by the cube method (hereinafter described).

Methods of Use—The filler shall be heated and poured into the joints to the full depth thereof, at a temperature of not less than 300 degrees Fahr., nor greater than 350 degrees Fahr. All joints shall be completely filled to the top. The top dressing of sand shall be spread over the pavement immediately after the filler is applied and while it is still soft. In cold weather the sand shall be heated so as to readily bond with the pitch. Extra care shall be used at the gutters and around catch basins, etc., to effectually prevent the leakage of water into the sub-roadway.

SEC. 23. *Test for Melting Point of Pitch Filler*—A clean shaped one-half ($\frac{1}{2}$) inch cube of the pitch is to be formed in the mold and suspended in the beaker so that the bottom of the pitch to be tested is one (1) inch above the bottom of the beaker. The pitch is to remain for five (5) minutes in water of a temperature of 60 degrees Fahr. before heat is applied. Heat is to be applied in such a manner that the temperature of the water is raised 9 degrees Fahr. each minute. The temperature recorded by the thermometer at the instant the pitch touches the bottom of the beaker to be considered the melting point.

ASPHALT FILLER.

SEC. 24. The interstices of the brick shall be completely filled with an asphalt filler heated to a temperature of not less than 350 degrees Fahr. nor more than 450 degrees Fahr. This asphalt filler shall not contain pitch nor any part of coal tar. It shall contain at least ninety-eight (98) per cent of bitumen soluble in carbon disulphide. It shall remain pliable at all temperatures to which it may be subjected as a street paving filler; it shall be absolutely proof against water and street liquids; it shall firmly adhere to the brick and be pliable rather than rigid. Care shall be exercised to completely fill all openings around street structures and the street shall not be used for traffic until the filler is completely set. A top dressing of sand shall be spread immediately after the filler is applied and while it is still soft.

SEC. 24. The penetration shall conform to the following:

No. 2 Needle 5 sec. 100 Grammes at 77 deg. F. 25 to 60.

No. 2 Needle 1 min. 200 Grammes at 32 deg. F. not below 25.

No. 2 Needle 5 sec. 50 Grammes at 115 deg. F. not above 110.

MAINTENANCE.

SEC. 25. The period of guaranty shall be five (5) years. During the period of guaranty, whenever the surface of a vitrified brick pave-

ment becomes uneven, holding water one-fourth ($\frac{1}{4}$) of an inch or more in depth in a distance of four feet or less, or when the pavement has settled over trenches existing previous to the completion of the pavement, then the brick shall be taken up and relaid to proper crown and grade.

Any brick which may be found soft, unsound, broken or disintegrated, and all portions of the pavement which may have become rough by reason of the chipping or breaking of the edges of the brick, so as to produce joints exceeding one-half ($\frac{1}{2}$) inch at a point one-quarter ($\frac{1}{4}$) inch below the surface of the brick, shall be removed, and properly replaced with sound material.

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MR. LEWIS: Mr. President, the Chairman of the Committee on Wood Block Paving Specifications must leave the city tonight, and if we are to adjourn at 4 o'clock I would like to ask whether or not the report of the committee could be received now?

MR. TILLSON: I move that it be received now, Mr. Chairman.

VICE-PRESIDENT TONSON: It is moved and seconded that the report of the committee be received now. All in favor signify by saying "Aye"; contrary "No." Carried.

MR. LEWIS: Thank you. (Reads the report.)

PRESIDENT HARDEE (in the Chair): You have heard the report read. It is moved and seconded that it be adopted. The question is open for discussion. Does anyone desire to discuss the report?

MR. CHURCH: Mr. Chairman, speaking on the oil specification only, I would say that the slight modification of Specifications "A" and "B" is to be commended. The fundamental objection to Specification "A," from the manufacturers' standpoint was very well pointed out in the discussion at the New Orleans meeting when Mr. Barnard and Mr. Buehler, speaking on behalf of the block manufacturers' association, and Mr. Sibley of our own company. . . .

MR. TILLSON: You mean "A" or "B"?

MR. CHURCH: Specification "A," Mr. Tillson. The objection of the manufacturers to that specification is that under one specification a choice of materials is permitted in that the oil may be derived either from coal tar or water gas tar. This leaves it on competitive bidding at the option of the manufacturer as to which product he shall use, and it is to be supposed that in most cases the cheaper

product would be used. Assuming that to be correct, it would be impossible for a city adopting these specifications as printed to secure the kind of oil now used in Chicago, St. Louis, New York, Detroit and Minneapolis. I would merely say further that of the organizations and associations in this country that have attempted to standardize creosote oil specifications, the National Electric Light Association has drawn up a separate specification for the coal tar product and the water gas tar product. The American Railway Engineering Association, which has considered creosote oil specifications longer than any other organization, has not, as yet, drawn up a specification for the water gas tar product. The Forest Products Laboratory of the United States Government has issued several bulletins, the object of which was to assist the consumers of creosote oil in determining whether they were securing a coal tar or water gas tar product, thereby recognizing that while both of these products may be valuable, the consumer is entitled to know which he is using. The Wood Preservers Association, including all creosoters of the United States, received a report of their Preservative Committee. The committee has not attempted, after a year's deliberation, to draw up specifications, but it did attempt to define the terms used in connection with tar and creosote in such a way as to assist the consumer in knowing what sort of a product he was obtaining, and deplored the looseness of the use of these terms. In the light of these facts, I think it is to be regretted that this committee did not make some modification so that the water gas tar product could be obtained under separate specifications from the coal tar product.

MR. BEATY: In connection with the remarks made by the previous speaker, I think it only fair to say that these various considerations came up in the meeting of the committee, and the object desired in retaining broad specifications was in order to leave it free for the public to use any of several specifications, and to encourage experimentation. Also my purpose in making these remarks is that the public shall get some fair idea of the usage of these specifications. These specifications are not supposed to limit the public to the use of only one specification, but to supply broadly data from which specifications may be prepared. The very best pavement can be manufactured by using only the best oil; however, other pavements, owing to different conditions of traffic and different localities in which they must be laid, would not

justify the use of the best; for that reason there is an article appended to our report in which the public is requested to experiment widely and let us know the results of those experiments, that is, in regard to the wisdom of using water gas tar in comparison with coal tar distillates. These are questions which the committee did not feel competent to pass upon without going too deeply into the subject.

MR. TILLSON: Mr. Chairman, I think possibly Mr. Church has misunderstood the idea of the specifications. In Specification "A" where it does permit either water gas tar oil or coal tar oil to be used, it is not intended that if any city is to advertise for wood block pavements that it would have both of these in its specifications; that is, it would call for water gas tar or it would call for coal gas tar specifically, just the same as if it wanted yellow pine it would call for yellow pine, or if it wanted Douglas fir it would call for Douglas fir, so that the specification itself would be specific. While this association would permit either, it does not mean that the specification for any individual work would call for both classes of material.

MR. CHURCH: Mr. Tillson, if I may be pardoned for saying another word—it does seem to me that if I have misunderstood the purport of this specification, it might well be misunderstood by a great many cities. You say "Preservative—Specification "A." The oil shall be a product of coal gas, water gas or coke oven tar," etc., and unless an engineer were very familiar with the fact that those were separate and distinct products, it is entirely conceivable that he would have that specification printed as it now exists. I think that the report of the Bituminous Concrete Committee, in which they have drawn specifications separately for a coal tar cement binder and a water gas tar cement binder, recognizes that point.

MR. CUTTER: I agree with Mr. Church because I know of one specific instance last year. The City of Duluth followed your specifications exactly and there was so much turmoil and confusion as to what would be used that the work was all knocked out.

MR. TILLSON: I would only say in regard to that, Mr. President, that the Chairman of the committee, in committee, in reply to some remarks that were made, said "why, you want fool-proof specifications," and the general consensus of opinion was that it would be impossible to write "fool-proof" specifications.

MR. LOUD: I think it is more or less of a mistake to cut the use of southern black gum out of the specifications, as it takes it out of competition with southern yellow pine in the district where we cannot use anything but southern yellow pine. The Douglas fir and the Norway pine, which have been included, can be obtained in other sections of the country, and you leave the city engineer at liberty in drawing up his own specifications to specify either long leaf or any other wood. The price of long leaf yellow pine is liable to go up very much higher than it is now unless there is some competing wood in the district from which that pine comes; and I think in the interest of the cities and the people who have to pay the bill that this alternative wood, in those sections, should be included. I will admit that some of the first southern black gum that was used did not give satisfactory results but that was due entirely to faults in manufacture and later southern black gum blocks have given better results than any other wood, except long leaf pine.

MR. BEATY: I would like to say for the information of some of the gentlemen present, that the term "southern yellow pine" is not supposed to include only long leaf but several varieties of pine from which an alternative can be selected.

PRESIDENT HARDEE: Mr. Chairman of the Committee, the Chair would like to ask—I presume, while you have not announced it—a full discussion was given to the material men and to all delegates of this convention to appear before your committee.

MR. LEWIS: The committee held open session from yesterday morning to 12:30 today, with the exception of an executive session between 3:30 and 5:00 last night, and we endeavored to hear everybody. Nothing has been said on the floor today that we did not hear in the committee.

PRESIDENT HARDEE: That is just what I am trying to arrive at, whether the objections presented on the floor of the convention were presented to the committee, or whether these questions had been discussed with the committee.

MR. LEWIS: They were discussed at considerable length this year and at even greater length last year when we had about three days instead of a day and a half.

MR. MACGREGOR: Might I ask if short leaf was considered?

MR. LEWIS: The committee believes that its designation "southern yellow pine" includes both long leaf and short leaf. As to the gum, gentlemen, I may say a word. Some years ago the inclusion of gum in the specifications was urged for the same reason that Mr. Loud just referred to, that it might check the raising of the price of yellow pine,

especially long leaf yellow pine. The gum was therefore included. I believe that the price of yellow pine today is not substantially more than it was a year ago. In fact, I believe that the price of yellow pine is less than it was when the inclusion of gum was recommended. The committee has no reason to believe that the shrinkage in price was due to the inclusion of gum. We do know, and it has been admitted, that some of the experiments with gum have not been entirely satisfactory. Its producers claim that they now know what was the trouble and we have every reason to believe that gum is capable of making a thoroughly good pavement; and it was to that particular material that the committee referred in its report when it said: "We are of the opinion that there are other native woods which will, under proper treatment and manipulation, prove to be satisfactory for street pavements. We also believe that certain woods, the use of which has not been wholly successful, will, with a better knowledge of their peculiar requirements for treatment, prove to be suitable." In the judgment of the committee we had better have the suitability of any wood proven beyond a peradventure before including it in our specifications.

MR. INGRAM: Mr. President, there is one thing that I think ought to be a little more definite, and that is just what is meant by southern yellow pine. Some thirty or forty years ago we recognized a Mason and Dixon line, but that has been obliterated now and I think they should be a little more definite in describing what is southern yellow pine.

MR. LEWIS: We have every reason to believe that southern pine has been so defined in the United States bulletins of Forestry Service and elsewhere and is such a definite term in the trade, that it means not only the long leaf pine, but it means short leaf pine, and it would doubtless include what is commonly called loblolly pine.

MR. SHERRERD: In view of what Mr. Tillson has stated regarding the specifications concerning tar, I suggest that the committee add a footnote to the bottom of page 99 to the effect that each specification should designate the kind of tar to be used.

MR. TILLSON: You mean preservative?

MR. SHERRERD: Yes. It says water gas tar or coal gas tar. The note might specify the kind of tar from which the preservative is to be made.

MR. CONNELL: I think Mr. Sherrerd's suggestion is a good one and it would probably be desirable to incorporate in the report something to the effect that the origin of the oil should be specified in all cases, stating whether it is derived from one particular source or a mixture of oils. There seems to be some question about how the different oils will act, and I think Mr. Sherrerd's suggestion is one that would probably result in the accumulation of some valuable data in this connection.

MR. LEWIS: Do you mean in the bid or the specification?

MR. SHERRERD: In the specification, that the following words be used as a note: Specification "A" and "B," under the heading "Preservative," bottom of page 99, so that there will be an additional footnote qualifying the word "tar." "The specification shall—"

MR. BEATY: I suggest amplifying that note by inserting "and designating the percentages of fractions and fractionating limits." A city does not know what kind of oil it is buying unless it has some fractionating limits, and percentages of distillates between these points stated in the specifications. Two oils might be of the same specific gravity, and of the same coal tar origin, yet if one was a "straight distillate," and the other was obtained "from the distillation" (of coal tar) they might vary seriously in their chemical composition. The distillation oil might be a mixture of various fractions.

PRESIDENT HARDEE: The motion now is on the adoption of the amendment to Mr. Sherrerd's motion offered by Mr. Beaty.

MR. TILLSON: Do I understand that this is a motion to amend the report?

PRESIDENT HARDEE: Yes, sir.

MR. TILLSON: That can't be done.

MR. SHERRERD: Add a footnote.

MR. TILLSON: That can't be done after the committee has made its report.

MR. SHERRERD: I would ask the committee to do this.

MR. TILLSON: The committee is not all here. An important member of the committee has left town. Now, I don't want to be butting in; the chairman has told me that I was at the bottom of the committee and made sure I would be there, but I would suggest some such action as this: that the report be adopted and then let Mr. Sherrerd make his motion that it be the sense of this meeting that when it is printed it be added as a footnote.

PRESIDENT HARDEE: Forgetting for the time the proceedings under which we are acting, the Chair declares that the motion of Mr. Sherrerd and its amendment by Mr. Beaty are out of order, and we will go back to the adopting of the report as submitted. Any further discussion? All those who favor the adoption of the report as read signify by saying "Aye;" all those opposed "No." The report stands adopted.

MR. SHERRERD: Now, Mr. President I move that it is the sense of this meeting that the specifications for wood block under the heading "Specification 'A' and 'B'," sub-heading "Preservative," that a note be added to this effect: "Each specification should designate the kind of tar from which the preservative shall be made."

MR. KLEIN: I would like to see an amendment to that because the use of water gas tar is patented and the city may get in conflict with the patent laws in specifying it.

Motion of Mr. Sherrerd seconded.

PRESIDENT HARDEE: Mr. Klein, I believe you merely made the remark; you did not make that as an amendment.

MR. KLEIN: I make that as an amendment, that the water gas tar be left out.

PRESIDENT HARDEE: The very purpose of Mr. Sherrerd's motion is to take care of that.

The question.

PRESIDENT HARDEE: All those in favor of the adoption of Mr. Sherer's motion as you have heard it read, signify it by saying "Aye;" contrary "No." Motion carried.

The following is the amended and adopted

REPORT OF THE COMMITTEE
ON
CREOSOTED WOOD BLOCK PAVING SPECIFICATIONS.

Pittsburgh, Pa., February 26, 1913.

To the President and Members of the
Association for Standardizing
Paving Specifications:

Gentlemen: Your Committee on Creosoted Wood Block Paving Specifications submits the following report:

The Committee by correspondence and personal interviews has endeavored to secure all available data concerning experiences which may have been had since the New Orleans meeting and under the specifications adopted at that meeting. It is quite evident that an interval of one year is entirely too brief a period to produce results which would permit an intelligent revision of the specifications. Not only is there a lack of precise data, but there is a great difference of opinion as to the causes of troubles which have been experienced with wood pavements. Many of these troubles, we believe, can be rectified, but it is impossible at the present time to prescribe an effective remedy. The conditions to which we refer are indicated by a preliminary report of the Committee, abstracting the replies received to inquiries submitted to cities, members of the Association and others, a copy of which is submitted as an appendix to this report.

Your Committee has heard at length representatives of the timber and manufacturing interests, and while a number of changes have been suggested, and while it has been recommended that the specifications be elaborated in some particulars, your Committee is not prepared to recommend any radical changes in the specifications adopted at New Orleans.

Your Committee believes that investigation and experiment with woods not named in the proposed specification should be encouraged. We are of the opinion that there are other native woods which will, under proper treatment and manipulation, prove to be satisfactory for street pavements. We also believe that certain woods, the use of which has not been wholly successful, will, with a better knowledge of their peculiar requirements for treatment, prove to be suitable.

While we do not feel justified in including them in this specification until their suitability for the purpose shall have been demonstrated, we strongly recommend that their use be encouraged, either for the purposes of experiment or in localities where the kinds of wood named in the specification are not readily available. The Committee requests members of the Association and others to give it the benefit of their experiences in the use of such woods and to furnish it with such data as they may be able to secure.

SPECIFICATIONS FOR PAVING WITH CREOSOTED WOOD BLOCKS.

TIMBER.

The wood to be treated shall be southern yellow pine, Norway pine, Douglas fir, or tamarack; but only one kind of wood shall be used in any one contract.

Yellow pine blocks shall be made from what is known as southern yellow pine, and shall be well manufactured, full size, saw-butt, all square edges, and free from all defects, such as checks, unsound, loose or hollow knots, knot holes, worm holes, through shakes and round shakes that show on the surface. In yellow pine timber, the annular rings shall average not less than seven (7) to the inch, and shall in no case be less than five (5) to the inch, measured radially from the heart so as to include the greatest number of rings possible.

Norway pine, Douglas fir and tamarack blocks shall be cut from timber that is first class in every respect, and shall be of the same grade as that defined for southern yellow pine.

SIZE OF BLOCKS.

The blocks shall be from five (5) to ten (10) inches long, but shall average eight (8) inches; they shall be from three (3) to four (4) inches in width; and they shall be four (4) inches in depth.* The blocks used in any one street or improvement, however, shall be of uniform width, and there shall be always a difference between the width and depth of the blocks of not less than one-quarter ($\frac{1}{4}$) of an inch.

A variation of one-sixteenth ($\frac{1}{16}$) of an inch shall be allowed in the depth, and one-eighth ($\frac{1}{8}$) of an inch in the width of the blocks.

PRESERVATIVE.**

SPECIFICATION "A."

The preservative to be used shall be a product of coal gas, water gas, or coke oven tar, which shall be free from all adulterations and contain no raw or unfiltered tars, petroleum compounds, or tar products obtained from processes other than those stated.

*Note: The depth of the blocks may be reduced to three and one-half ($3\frac{1}{2}$) inches in medium traffic streets, and to three (3) inches on light traffic streets or alleys. The width and depth of the blocks, however, must never be equal. In case blocks three (3) inches in depth are used, they shall not exceed eight (8) inches in length.

**Each specification should designate the kind of tar from which the preservative shall be made. See page 108.

The specific gravity shall not be less than one and eight-hundredths (1.08) nor more than one and fourteen-hundredths (1.14) at a temperature of thirty-eight (38) degrees centigrade.

Not more than three and one-half ($3\frac{1}{2}$) per cent shall be insoluble by continuous hot extraction with benzol and chloroform.

On distillation, which shall be made exactly as described in Bulletin No. 65 of the American Railway Engineering & Maintenance of Way Association, as shown in the appendix to these specifications, the distillate, based on water free oil, shall not exceed one-half ($\frac{1}{2}$) of one (1) per cent at one hundred and fifty (150) degrees centigrade, and shall be not less than thirty (30) nor more than forty (40) per cent at three hundred and fifteen (315) degrees centigrade.

The oil shall contain not more than three (3) per cent of water.

The manufacturer of the blocks shall permit full and complete sampling at all times and places, and shall, if required, furnish satisfactory proof of the origin of the preservative.

Samples of the preservative, taken from the treating tank during treatment, shall at no time show an accumulation of more than two (2) per cent of sawdust, dirt or other foreign matter. Due allowance shall be made for such accumulation of foreign matter by injecting an additional quantity of oil into the blocks.

SPECIFICATION "B."

The preservative to be used shall be a distillate of coal gas or coke oven tar, and shall be free from all adulteration and contain no raw tar, filtered or unfiltered tars, or pitches, petroleum compounds or other tar products.

It shall be completely liquid at thirty-eight (38) degrees centigrade, and shall have a specific gravity at that temperature of not less than one and three-hundredths (1.03) nor more than one and eight-hundredths (1.08).

It shall contain not more than two (2) per cent of matter insoluble by hot extraction with benzol and chloroform.

On distillation, which shall be made exactly as described in Bulletin No. 65 of the American Railway Engineering & Maintenance of Way Association, as shown in the appendix to these specifications, the distillate, based on water free oil, shall be within the following limits:

At 210 degrees centigrade, not more than 5 per cent.

At 235 degrees centigrade, not more than 35 per cent.

At 315 degrees centigrade, not more than 85 per cent.

The oil shall yield a coke residue not exceeding three (3) per cent.

The distillate, between two hundred and ten (210) degrees centigrade and two hundred and thirty-five (235) degrees centigrade, shall yield solids on cooling to fifteen (15) degrees centigrade. The preservative shall contain not more than three (3) per cent of water.

The manufacturer of the blocks shall permit full and complete sampling at all times and places, and shall, if required, furnish satisfactory proof of the origin of the preservative.

Samples of the preservative taken from the treating tank during treatment shall at no time show an accumulation of more than two (2) per

cent of sawdust, dirt or other foreign matter. Due allowance shall be made for such accumulation of foreign matter by injecting an additional quantity into the blocks.

Note: The Engineer may, at his discretion, use either the Specification "A" or "B," or both, depending on local conditions.

TREATMENT.

The blocks shall be treated with the preservative under pressure and shall at no time be subjected to a temperature of over two hundred and forty (240) degrees F. They shall, after treatment, show satisfactory penetration of the preservative, and all blocks that have been warped, checked or otherwise injured in the process of treatment, shall be rejected.

The blocks shall be treated with the preservative so that they shall contain not less than eighteen (18) pounds per cubic foot.

Note: This amount may range from sixteen to twenty pounds, at the discretion of the Engineer, dependent on local conditions.

INSPECTION.

The blocks shall be subject to inspection before, during and after treatment, and may be reinspected at any time. The plant shall be equipped with gauges and appliances necessary for proper inspection, and every facility for this inspection shall be afforded.

Note: The following method is recommended for testing blocks taken from the street. The blocks shall be tested for amount of preservative contained by boring a hole three-fourths ($\frac{3}{4}$) of an inch in diameter through the block parallel to the fibre at a point half way on the longest line that can be drawn from the center of the heart to the edge of the block. If the center of the heart does not occur in the block, the hole shall be bored in the center. The borings shall be mixed and an average sample taken.

FOUNDATION.

The base shall be of concrete made of the materials and in accordance with the methods prescribed in the specifications for cement and concrete adopted at the 1913 meeting and shall be not less than six (6) inches thick at all points.

Note: The thickness of the concrete base may be reduced to five (5) inches on light traffic streets and in exceptional cases to four (4) inches at the discretion of the Engineer.

For other requirements see report of Committee on Cement and Concrete Paving Specifications.

SAND CUSHION.

The blocks shall be laid on a cushion of clean, coarse sand one (1) inch in thickness, which shall be struck to a surface parallel with the grade and contour of the finished pavement.

MORTAR CUSHION.

Before placing the cushion the surface of the concrete shall be cleaned and thoroughly dampened. A layer of sand and cement one (1) inch in thickness, mixed dry in the proportion of one (1) part of Portland cement to four (4) parts of sand, shall be spread upon the concrete foundation and struck to a surface parallel to the grade and contour of the finished pavement.

This cushion of sand and cement, unless previously moistened, shall be lightly sprinkled with water, and the blocks shall be immediately set thereon.

Note: Under special conditions, particularly where vibration may be expected, the sand or mortar cushion may be omitted and a bituminous coating, spread upon a smoothly finished and thoroughly dry concrete base, substituted therefor.

FILLER.

When the blocks are laid upon the sand cushion, the joints between the blocks shall be filled with a suitable bituminous filler. When the blocks are laid upon a mortar or bituminous cushion, the joints may be filled with sand.

EXPANSION JOINTS.

A longitudinal expansion joint not less than three-quarters ($\frac{3}{4}$) of an inch in width and filled with a suitable bituminous filler shall be placed along the curbs.

Respectfully submitted,

NELSON P. LEWIS, Chairman,
Chief Engineer Board of Estimate and Apportionment, New York City.

ELLIS R. DUTTON, Vice-Chairman.
Assistant City Engineer, Minneapolis, Minn.

W. PURVES TAYLOR,
Assistant Engineer Testing Laboratory, Bureau of Surveys, Philadelphia, Pa.

L. A. DUMOND,
Engineer, the Chicago Association of Commerce, Chicago, Illinois.

GEORGE W. TILLSON,
Consulting Engineer, President Borough of Brooklyn, New York City.

JAMES H. SULLIVAN,
Division Engineer Highways, Boston, Mass.

R. ERNEST BEATY,
General Inspector Department Public Works, Borough of Manhattan, New York City.

SPECIFICATIONS FOR ANALYSIS OF COAL TAR CREOSOTE.

SAMPLE.

In view of the fact that everything depends upon the samples taken for analysis, too much care cannot be used to make sure that such samples are strictly average ones to the whole bulk of the oil.

To this end the oil should be completely liquified and well mixed before any samples are taken. Wherever possible, a drip sample of not less than two gallons should be taken, commencing after the oil has started to run freely. Where this cannot be done, as for instance in large storage tanks, samples should be taken from various depths in the tank, by means of a tube or bottle, the number of samples depending on local conditions.

For taking samples during the process of treatment, it is desirable to take a sample of oil from the storage tank about one foot from the bottom of the tank before the cylinder is filled, and, where possible, a sample directly from the cylinder during the process of treatment. For this purpose a thermometer well, as shown in attached figure, is recommended.

The sample to be analyzed should be thoroughly liquified by heating until no crystals adhere to a glass stirring rod, and also well shaken, after which one-half shall be taken for analysis and the balance reserved as a check test.

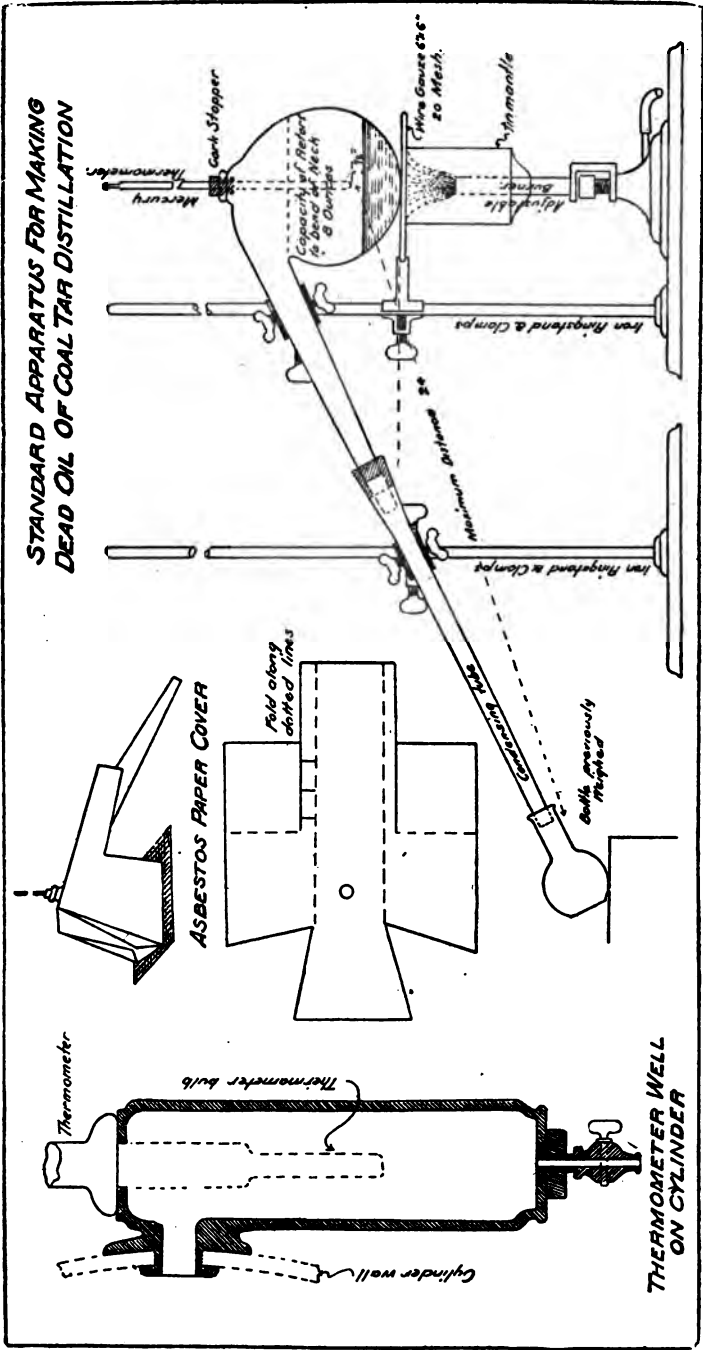
APPARATUS.

The apparatus for distilling the tar oil or creosote must consist of a stoppered glass retort similar to that shown in diagram, having a capacity as nearly as can be obtained of eight ounces up to the bend of the neck when the bottom of the retort and the mouth of the offtake are in the same plane. A nitrogen-filled mercury thermometer of good standard make, divided into full degrees centigrade, must be used in connection therewith. The bulb of the retort and at least two inches of the neck must be and remain covered with a shield of heavy asbestos paper, shaped as shown in diagram, during the entire process of distillation, so as to prevent heat radiation, and between the bottom of the retort and the flame of the lamp or burner two sheets of wire gauze, each 20-mesh fine, and at least six inches square, must be placed.

It is also recommended that the flame be protected against air currents. An ordinary tin can, from which a portion of the bottom and all of the top have been removed, placed on a support attached to the burner, as shown on diagram, has been found to answer the purpose.

DISTILLATION.

Before beginning the distillation, the retort should be carefully weighed and exactly one hundred grammes of the oil placed therein, the



same being placed in the retort. The thermometer should be inserted in the retort with the lower end of the bulb one-half inch from the surface of the oil, and the condensing tube attached to the retort by a tight cork joint. The distance between the bulb of the thermometer and the end of the condensing tube should not be less than twenty nor more than twenty-four inches, and during the progress of the distillation, the thermometer must remain in the position originally placed.

The distillates should be collected in weighed bottles and all fractions determined by weight. Reports are to be made on the following fractions:

- 0 to 170 degrees centigrade.
- 170 to 200 degrees centigrade.
- 200 to 210 degrees centigrade.
- 210 to 235 degrees centigrade.
- 235 to 270 degrees centigrade.
- 270 to 315 degrees centigrade.
- 315 degrees centigrade and above.

For practical purposes there will be no need of reporting on all of these fractions. It will be sufficient to report on the fractions as follows:

- Below 200 degrees centigrade.
- 200 to 210 degrees centigrade.
- 210 to 235 degrees centigrade.
- 235 to 315 degrees centigrade.
- Above 315 degrees centigrade.

Reports are to be made on individual fractions. In making such reports it is to be distinctly understood that these fractions do not necessarily refer to individual compounds. In other words, the fractions between 210 and 235 degrees will not necessarily be all naphthalene, but will probably contain a number of other compounds. The distillation should be a continuous one, and should take about forty-five minutes. When any measurable quantity of water is present in the oil, the distillation should be stopped, the oil separated from the water, and returned to the retort, when the distillation should be recommenced and the previous readings discarded. In obtaining water-free oil, it will be desirable to free about 300 to 66 cc. of the oil by using a large retort and using 100 grammes of the water-free oil for the final distillation. In the final report as to fractions a correction must be made of the amount of water remaining, so that the report may be made on the basis of a dry oil.

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PRESIDENT HARDEE: It is moved and seconded that the convention now adjourn until tomorrow morning at 10 o'clock. All in favor please signify by saying "Aye;" contrary "No." It is so ordered.

THURSDAY, FEBRUARY 27, 1913.

PRESIDENT HARDEE: The convention will now please come to order. The Chair desires particularly to congratulate the membership for the large attendance this morning after the strenuous evening we had yesterday. It is very apparent that there is a full, or more than a full, quorum here and if satisfactory to the members we will dispense with the roll call.

Acting under the resolution that was passed by the convention at its opening session, since we have been in Pittsburgh we have had five associate members admitted and the Secretary will now please announce them.

MR. HITTELL: New associate members: General Petroleum Company, by R. H. Parker; Standard Oil Company (New Jersey), by R. L. Christie, W. D. Craven, Jr., Herbert Spencer; United Gas Improvement Company, by W. H. Fulweiler; Warner-Quinlan Asphalt Company, by A. R. Knight; F. J. Lewis Mfg. Co., by F. J. Lewis.

Delegates have reported since yesterday's session: Columbus, Ohio, Henry Maetzel, city engineer. Associate member: Standard Asphalt and Rubber Company, Mr. Levering of Chicago.

PRESIDENT HARDEE: We will now proceed with the committee reports. I will ask for the report of the Committee on Cement and Concrete Pavements. Mr. Babcock, I believe, is chairman.

MR. BABCOCK: Your committee feels some diffidence in making changes in the concrete specifications, but desires to present the following recommendations. In our printed report of the 1912 proceedings, page 63, after the subject "Placing Concrete," we insert another subject, "Drainage," to read as follows: "The sub-base, or that portion of the base under the concrete shall be properly drained." We did not go into any considerable detail as to the method of drainage because that is really up to the locality and the local engineer.

Then on page 64, under the heading of "Thickness," we recommend that the last paragraph be changed to read as follows: "The minimum thickness for wearing surface shall be three-quarters ($\frac{3}{4}$) inch."

On page 64, under the subject "Troweling," the first sentence should be changed to read, "After the wearing surface has been brought to the established grade, it shall be worked with a wood float in a manner that will thoroughly compact it. When required, the surface shall be troweled smooth, but excessive working with a steel trowel shall be avoided."

On page 65, under the subject "Dimensions," the last sentence should read, "The minimum thickness of the gutter shall be six (6) inches," and under the heading of "Forms," section 4 shall be changed to read, "The sections for combined curb and gutter shall not measure more than six (6) feet in length."

Page 66, under the heading, "Curb not Built in Place," in the first paragraph, "twenty-eight (28) days" be substituted for "ten (10) days."

Page 66, concrete for foundations, under the caption "Proportions," the last clause should be changed to read as follows: "And in no case shall less than one (1) bag (94 pounds) of cement be used for every six and one-half (6½) cubic feet of concrete in place." That is the recommendation of the committee.

On page 67, under the head of "Thickness," we recommend a change that the last paragraph shall read, "The minimum thickness for concrete foundation shall be six (6) inches."

PRESIDENT HARDEE: For sidewalk work?

MR. BABCOCK: No, for foundation of pavement.

Under "Specifications for Concrete Pavements," the first paragraph should be changed to read as follows: "Your committee recognizes the fact that there are several concrete pavements, including concrete pavements with a bituminous wearing surface now in use, on which patents have been applied for. We consider it outside the jurisdiction of this committee to pass upon the bituminous treatment of the surface. If any municipality should desire to lay any of these pavements, the materials used in the work should conform to the requirements of these standard specifications." We did not feel we could go into the matter of treating the concrete surface with bitumen in any standard sort of a way. There are two or three different propositions, I think; some of the bituminous covering of concrete, perhaps with a flouting of sand or a thicker layer of small stone and sand, make a veneering of anywhere from one-half inch to an inch thick. They have their various purposes, and we did not feel we should go into the matter; in fact, it is not a part of the work of this committee."

On page 68, under the caption "Proportions," the last clause shall read, "And in no case shall less than one bag (94 pounds) of cement be used for every four cubic feet of concrete in place."

MR. TILLSON: What kind of concrete does that refer to, Major?

MR. BABCOCK: That is for concrete pavement, not for concrete foundation for any other pavement.

PRESIDENT HARDEE: With the surface exposed to traffic without any cover?

MR. BABCOCK: It might or might not be. It is for a concrete pavement, a one-course pavement.

On page 68, under "Finishing," the first paragraph shall be changed to read as follows: "The pavement shall be finished by thorough hand tamping until the mortar flushes freely to the surface, and shaped to conform to the curvature of the finished pavement." The printed specification, I believe, provides for the use of a templet about half the width of the street and tamping with a templet, and we did not think that was a practical proposition; but the tamping of the concrete itself is always required to make a fair concrete surface for paving.

On page 68, under "Expansion Joints," the subject shall be changed to read as follows: "If desired expansion joints shall be placed at right angles to the curb line at intervals of fifty (50) feet."

To bring the matter up for discussion, Mr. President, I move the adoption of the report.

PRESIDENT HARDEE: The report has been read and it has been moved and seconded that it be adopted. The matter is now open for discussion.

MR. BEATY: In connection with the proportioning of concrete, it occurs to me that there is naturally a wide variation in the per cent of voids in different lots of crushed stone, even where so-called "run of crusher" stone is used. This variation may be caused in part by different qualities of the stone before crushing (hardness, toughness, etc.), or may be due to various types of crushers employed. Regardless of the cause, the condition certainly obtains, and for this reason I would like to make a suggestion in regard to proportioning crushed stone used in concrete. The suggestion is along the line of the voids in crushed stone. The same variation is found in the per cent of voids in different lots of sand, for this reason I would make the same suggestion about proportioning sand for mortar. The suggested specifications are as follows:

The concrete shall be composed of (a) Fine Aggregate, (b) Coarse Aggregate, and (c) Mortar, intimately and thoroughly mixed according to proportions and methods hereinafter specified.

(a) *Fine Aggregate* shall consist of sand or gravel varying in size, passing when dry through a screen with openings one-quarter ($\frac{1}{4}$) inch in diameter. It shall be of silicious material, clean, free from vegetable matter, loam or other deleterious material and not more than six (6) per cent shall pass a screen having one hundred (100) meshes per inch.

(b) *Coarse Aggregate* shall consist only of crushed trap, granite or

blue stone (equal in quality to best North River bluestone), except upon the written permission of the Chief Engineer of Highways.

Coarse Aggregate for Pavement Foundation shall consist of "run of crusher" that will be retained on a screen having openings one-quarter ($\frac{1}{4}$) inch in diameter, and will pass a screen having openings two and one-half ($2\frac{1}{2}$) inches in diameter. It shall be clean, hard, durable and free from crusher dust.

Coarse Aggregate for Curb Foundation shall consist of stone of the quality specified above, which is retained on a screen having openings one-quarter ($\frac{1}{4}$) inch in diameter and will pass a screen having openings one (1) inch in diameter.

(c) *Mortar* shall be made with fine aggregate (specified in Paragraph "A") mixed with such proportion of Portland Cement (specified by the Association) as will overfill the voids in the fine aggregate by at least five (5) per cent of such voids.

(d) *Concrete* shall be made of coarse aggregate mixed with such proportions of mortar made as above specified in sufficient quantity to overfill the voids in the coarse aggregate by at least ten (10) per cent of such voids.

(e) *Test of Voids*.—To determine the voids in the fine aggregate, or in the coarse aggregate, a vessel shall be prepared, the cubical contents of which is exactly one (1) cubic foot, being smaller at the top than at the bottom. This vessel shall be filled with the sample to be tested after thoroughly drying, and the vessel shaken or jarred until the aggregate is compacted as thoroughly as possible and the vessel is level full. The weight of this amount of material is then to be ascertained and same deducted from 166 (the weight of a one (1) cubic foot of the material of which the aggregate is composed). The difference thus obtained is to be divided by 166; the figure obtained being the percentage of voids for fine or coarse aggregate, as the case may be.

(f) In the absence of determinations of voids, the Contractor will be permitted to use concrete composed of one (1) part Portland Cement, three (3) parts fine aggregate and six (6) parts coarse aggregate, until determinations of voids can be made.

These suggestions are not original with me, but were made by Mr. Warren before the American Society in 1905, I think it was, and went no further than to be printed in an issue of "Engineering News" of that year.

MR. TILLSON: Do you mean the American Society of Municipal Improvements or Civil Engineers?

MR. BEATY: The "Civil Engineers," but I find to my surprise that Mr. Tonson has been using this specification for two years, and I think that inasmuch as all of our pavements depend for their life and durability on a good substantial foundation, we should get the very best possible foundation. Also, Mr. Warren suggested at this time that the use of such a specification would most likely render it possible to use a concrete of four inch thickness, which I think is worth consideration. If we can reduce the cost of the

foundation by getting a stronger concrete and using less of it we will have more money to apply to the wearing course of the pavement.

PRESIDENT HARDEE: Gentlemen, you have heard the suggestions of Mr. Beaty. Under our usual procedure the question is the adoption or rejection of the report. Anything in the way of amendments will have to be accepted by the committee and incorporated in the report. I would like to ask as a matter of information, Mr. Beaty, did you appear before this committee?

MR. BEATY: I did not, sir. I was working on wood block specifications.

PRESIDENT HARDEE: These suggestions, while they may be very valuable, and I might say necessary, are such a tremendous addition to the report that if I were a member of the committee I would hesitate to incorporate them in the report at this time.

MR. BEATY: The committee has a requirement of this kind in the specifications, but the objection is that the proportions are arbitrary. The proportioning I suggest is one that could be used to suit varying conditions.

PRESIDENT HARDEE: Well, Mr. Babcock, as chairman of that committee, is your committee prepared to accept the suggestions of Mr. Beaty and incorporate them into the report?

MR. BABCOCK: In the absence of the others of the committee I don't believe I would care to accept these amendments (although I think they are valuable) until they are submitted to the committee.

MR. KINGSLEY: While possibly there is merit to the suggestions that have been made, personally I would oppose putting so much more material into the specifications as he suggests. Mr. Beaty goes ahead and outlines a general plan for determining voids. It seems to me if we do that with all of the specifications we have and all the materials we have, we will have a book several times the size of the one Mr. Secretary has been furnishing us, and I think the more we condense the better off we will be. We should not elaborate too much, and I would be opposed to adopting the suggestions made. I think the committee has gone over it thoroughly and we have a good set of specifications. There is one point I would like to question Mr. Babcock on: The increase of the minimum in the concrete foundation from four inches to six inches in thickness. Do I understand that the increase is on concrete foundation or concrete pavements?

MR. BABCOCK: On concrete foundations.

MR. KINGSLEY: Mr. Chairman, I am very much opposed to that. I think all of us will agree that a 6-inch minimum for concrete foundations for pavements is pretty heavy. I have a great many thousand yards of pavements which have been down a good many years on 5-inch foundations and some on four inches, and I think when we establish a minimum we ought to establish a minimum which we can use as a minimum and not a minimum which will be a maximum to most of us. The maximum we use in our country under all conditions, even under the poorest soil conditions, is six inches. We never use anything over six inches, and we have never had any trouble; and it seems to me that this minimum of six inches is entirely too heavy and I would like to—Can we amend the report?

PRESIDENT HARDEE: No, but Mr. Kingsley, my recollection, from the statement made by Mr. Babcock was to the effect that this 6-inch thickness applied to a one-course pavement.

MR. BABCOCK: No, foundations.

PRESIDENT HARDEE: I heard him say just now "Foundations," but I thought in the reading of the report he said it applied to one-course pavement.

MR. KINGSLEY: That is why I asked this question, Mr. President, because on that proposition I might have been mistaken.

MR. BABCOCK: I think the committee's idea was this: That while it was possible to lay a 4-inch concrete, if you have it pretty well confined and held in and get uniformity, it might be serviceable. I know in our own experience, while we always expect to get six inches of concrete, and I don't doubt we do it, there are places in the foundation which are not six inches thick. That is why we thought if we stated a limit of four inches you sometimes might get less than four inches in the foundation. I don't believe we would object to any change that the engineers want to recommend in that respect, but that was our judgment, that we ought to provide for a minimum of six inches.

MR. KINGSLEY: That is where I differ. If you had provided that the standard foundation should be five inches or six inches that would be acceptable, but I do object to the words, "minimum of six inches."

MR. BABCOCK: What would you like to write in?

MR. KINGSLEY: I would like a minimum of four inches.

MR. BABCOCK: Then why not make it a standard of six inches?

MR. KINGSLEY: That would be all right, but I would object to a minimum of six inches.

MR. BABCOCK: Would you object to that, Mr. Reed? (Mr. Reed was called away.) I might take that responsibility. If you want to close the matter up I would say it will be satisfactory to the committee to write in a standard of six inches instead of a minimum.

PRESIDENT HARDEE: The report cannot be amended except by the committee itself. The report must be either accepted or rejected. If the chairman of the committee will accept your suggestions and correspondingly change his report that will take care of the matter you brought up, Mr. Kingsley.

MR. KINGSLEY: Yes, sir, that will take care of it.

PRESIDENT HARDEE: Then it is understood, Mr. Babcock, that you will make that change?

MR. BABCOCK: Yes, I will make it read "standard" instead of "minimum."

MR. HITTELL: The Secretary will change page 2 of your report—referring to page 67, under "Thickness"—so that the last paragraph will read, "Standard" instead of "minimum thickness."

MR. BABCOCK: If you please.

MR. TONSON: I consider the proportioning of concrete by voids instead of volume very important in the construction of concrete pavements. I have not followed it out so much in foundations, but in constructing one-course concrete pavements it is very necessary to have uniformity, and I have found the best results by proportioning by voids in cement pavements. I have laid several this last year and I think better results are obtained by proportioning by voids. I make that suggestion.

MR. MACGREGOR: I would like to ask Mr. Tonson how often he makes these determinations in his work. Does he do it every day or oftener?

MR. TONSON: We make the determinations of stone voids in every shipment that comes in. Stone voids are not always uniform. Determinations of sand are not so necessary because one determination generally answers and sand is uniform; but stone—I have not used any gravel—but with stone we make determinations each shipment. In the use of gravel for concrete pavement, I think it is quite necessary to proportion your voids because unless you have a separated gravel it always comes more or less uniform; but in the case of stone, you can get quite uniform results by taking proportions occasionally.

MR. HITTELL: For the aid of the Secretary, referring to page 68, you say under "Expansion Joints" "the subject shall be changed to read as follows: 'If desired, expansion joints shall be placed at right angles to the curb line at intervals of fifty feet.'" Do you intend the Secretary to change that sentence and leave all the rest?

MR. BABCOCK: Yes. The members may not recall the rest of the paragraph, which we desire to leave out.

MR. HITTELL: The committee reports, under "Expansion Joints," as published on page 67 and 68, the three paragraphs are eliminated and one paragraph is put in.

MR. BABCOCK: The whole section shall read, "If desired, expansion joints shall be placed at right angles to the curb line at intervals of fifty feet." The committee talked the matter over. I think our 1912 report provides for a wooden strip, and we thought if any one wanted to allow for expansion joints, transverse joints, he could do it. Personally I would just as soon put in a strip of metal and make the narrowest joint possible to make. I think we are all misled, or perhaps have a wrong idea of what is needed. There will not be much expansion in our climate of any kind of pavement we lay. Of course there is some we have to take care of. It does not need a very wide joint. I don't think we need to provide an inch in width or anything of that kind, and except for the protection of the edge of the concrete on a concrete pavement it would be as well to leave out the filler altogether. I don't know how you can get along with it. I suppose many use a bituminous filler or something you can pour, but that does not give you any real protection to the edge of the concrete, and that is why the committee left it in that open way. We don't feel that we want to make any considerable recommendation in the way of filling joints.

QUESTION: Are you referring to joints along the curb or transverse joints?

MR. BABCOCK: Particularly to transverse joints.

MR. SCHMIDT: I would like to ask Mr. Babcock if it is the idea to provide for 6-foot curb lengths on concrete curb and on combined curb and gutter.

PRESIDENT HARDEE: Yes, the report states that.

MR. SCHMIDT: It seems to me that there is nothing gained by reducing the curb length to 6 feet. On unprotected curb we have used 8-foot lengths in Brooklyn for many years,

and on the steel protected curb we use 10-foot lengths in order to conform with the standard length of the steel protection. I cannot see any object in reducing this length to 6 feet, because if the joint is cut through the curb, ample expansion is provided for, even though a 10-foot length be used.

MR. BABCOCK: I suppose that is a matter of judgment, Captain. I don't know that the committee would object to changing but our judgment was that 6-foot length was about right for a standard specification. That is exactly what we tried to do, to write in or write out of our present specification the necessary changes to make it more standard. I don't think we want to go into detail that will confine the engineer to something he does not want to stand for himself. There is plenty of latitude under our specification, but I don't think it is very material if he wants a curbing 8 feet long.

MR. SCHMIDT: I would like to suggest a minimum of 6 feet and a maximum of 10 feet.

MR. BABCOCK: You can't do that always, either. You might do it in New York but you can't do it all over.

MR. SCHMIDT: A shorter length would hardly apply except at corners.

PRESIDENT HARDEE: The Chair was about to suggest, growing out of his own experience—we are doing a great deal of concrete curb work, and in our business section we are using a steel protection, the steel nose or bar, and make the length 10 feet; but where we put in a concrete curb in the residential section without the steel protection, we put that in in 6-foot lengths.

MR. BABCOCK: That is what this has reference to.

PRESIDENT HARDEE: So, if the committee will accept the suggestion, I would suggest that the report be changed in that way, that the length be fixed at 6 feet for the ordinary curb without the steel bar and not more than 10 feet with the steel bar. I think that would take care of the point that Mr. Schmidt has raised.

MR. MACGREGOR: I should suggest that the length be made to conform to the length of the bar.

PRESIDENT HARDEE: It would seem to me, gentlemen, that the committee had in mind the building of a curb without the steel protection, and the matter can be taken care of if the committee will accept the suggestion and amend the report so as to fix a maximum length in case of a steel bar being used.

MR. TILLSON: As I read this report, that only refers to combined curb and gutter.

MR. BABCOCK: Yes.

PRESIDENT HARDEE: We are building combined curb and gutter, and we put it in 10-foot lengths, except that we make a cut in the gutter bottom every 5 feet, but the break in the curb itself is every 10 feet, the length of the bar.

MR. BABCOCK: The suggestion has been made, Mr. President and gentlemen, that the paragraph on page 65, relating particularly to combined curb and gutter, under the heading of "Forms," which now reads "The length shall not be more than six feet."

MR. HITTELL: Referring both to concrete curb and combined curb and gutter?

MR. BABCOCK: This is our recommendation, then, that the section for combined curb and gutter shall not measure less than 6 feet in length. That would cover Mr. Schmidt's point, would it not?

PRESIDENT HARDEE: I believe it does, Mr. Schmidt?

MR. SCHMIDT: That does not cover the concrete curb. It covers the combined curb and gutter. On page 65 under "Forms" a length of 6 feet is specified for concrete curb. I think this change should apply to both.

MR. HITTELL: Your idea is to change the word "more" to "less."

MR. SCHMIDT: Yes.

MR. BABCOCK: Very well, I would say that the committee will recommend that in the specifications, to write in "less" instead of "more."

MR. HITTELL: Then, with the consent of the committee, on page 65, Section 4, under "Forms," the committee changes its report to read as follows: "The work shall be blocked out in sections which shall measure not less than 6 feet in length." Is that right?

MR. CHRIST: It might be made a half mile long.

MR. SCHMIDT: I would make it "not less than 6 feet nor more than 10 feet."

MR. CHRIST: I would suggest "not more than six nor less than four," in your common curbing, but if it is reinforced or you use a steel bar, make it not more than 10 nor less than 6 feet.

PRESIDENT HARDEE: It would seem from the report that the committee had in mind an unprotected curb entirely.

MR. CHRIST: You say not less than 6 feet, but the contractor could make it 600 feet and not a joint.

PRESIDENT HARDEE: I think there should be a variation and a limit fixed both ways.

MR. SCHMIDT: I think so, too. Not less than 6 nor more than 10 would be better.

PRESIDENT HARDEE: Would that be satisfactory?

MR. BABCOCK: I can't speak from my own experience because we have not laid much concrete curb nor concrete curb and gutter combined; the other gentlemen have.

MR. CHRIST: We build concrete curb in Grand Rapids, and our specifications say "not more than 6 feet 4 inches and not less than 4 feet" for curb that is not reinforced.

MR. BABCOCK: Our idea was to draw up a paragraph which might be regarded as a safe line of practice. If the gentlemen want to write that in, I think the committee would be very glad to have them do so. In other words, we don't want to be arbitrary.

PRESIDENT HARDEE: Do I understand that the committee is willing to differentiate between the protected curb and the unprotected curb? If you do that, it might be well to make a minimum of 4 feet and a maximum of 6 feet for unprotected curb and a minimum of 6 feet and a maximum of 10 feet for protected curb.

MR. BABCOCK: That would be very satisfactory.

PRESIDENT HARDEE: Then, if the chairman accepts those suggestions and will amend his report that can be done. Is there any one else wishes to be heard?

MR. BABCOCK: Yes, we will be very glad to do it.

MR. KINNEY: I appeared before this committee and unfortunately we got to the concrete pavements last and one or two points were overlooked. I wish to beg your pardon for bringing up these points now instead of at the meeting of the committee. Under "Concrete Pavements—Coarse Aggregate—page 67, last line," the specification states that as heretofore recommended in specifications for concrete pavement foundation the maximum size for coarse aggregate for pavement foundations is one-half the thickness of the concrete in place, so that with a 7 or 7½-inch concrete pavement 3½ or possibly 4-inch gravel or stone could be used. This would not be good practice and I therefore suggest the substitution of the word "Sidewalks" for "Pavement" foundations, thus making the coarse aggregate the same as that for sidewalks, (i. e., ¼-inch to 1-inch material). Under expansion joints my understanding is that everything after the first sentence is cut out. Is this correct?

PRESIDENT HARDEE: Yes.

MR. KINNEY: Therefore, the wood joint is eliminated.

PRESIDENT HARDEE: Yes. I would like to ask if you were before this committee.

MR. KINNEY: Yes.

PRESIDENT HARDEE: It is unfortunate that you did not take these matters up with the committee. I can well appreciate how difficult it would be if I were chairman of a committee to have this much matter handed to me at this late hour. That is the purpose of the committee meetings. As I have previously announced, we cannot amend this report; it must be either accepted or rejected and the only way it can be changed is by the consent of the committee itself. What is your desire, Mr. Babcock?

MR. BABCOCK: I don't think I would object to it at all, but it is a refinement that I think is hardly necessary. We have a report that has been used for some time. If it amounts to anything, if the gentlemen particularly care to make any change, I will be glad to do it, but, personally, I would say to leave it alone—leave it as it is.

PRESIDENT HARDEE: Does any other gentleman desire to be heard?

MR. KINGSLEY: I am not quite satisfied with that expansion proposition. We got off of that and on to this curb before we got through, and it seems to me the proposition left by the committee is rather indefinite. I should like personally to have a little more information from the committee or some of the members here, as to what we really think about this expansion proposition, and what is absolutely necessary in the way of expansion joints, rather than have the matter left as it is on page 68, I believe.

MR. HITTELL: The committee's report is to the effect that everything pertaining to expansion joints, at the bottom of page 68 and the first paragraph on page 69, be cut out, and for that is substituted one sentence: "If desired, expansion joints shall be placed at right angles to the curb line at intervals of fifty feet."

MR. KINGSLEY: Well, it seems to me, Mr. President, and Mr. Chairman, we should have a little more definite information rather than submit this specification to the engineers throughout the country in this form.

PRESIDENT HARDEE: It is very plain the committee could not gather sufficient information upon which to base a recommendation as to expansion joints, so, in effect, they left any recommendation as to that out of the report, merely making reference to it. Speaking from experience at home, we have quite a large yardage paved with Blome pavements, which you know is a 6-inch concrete foundation with a 2-inch wearing surface added to it of a very much finer aggregate, in the proportion of one part Portland cement to one and one-half parts fine granite screenings in four assorted sizes with the crusher dust removed.

My experience is that transverse joints are of no practical value in my section of the country at all. We do have transverse joints seventy-five feet apart and we have longitudinal joints, and so far as we are concerned, the latter give all of the movement there may be to the pavement. I can't see that we get any benefit from the transverse joints. In fact I am sorry they are in, and if I build any more I don't intend to put them in.

MR. BABCOCK: Your committee came very near to the point of cutting out that whole paragraph and not making any provision at all, but we thought that some engineers' experience had led them to use them or require them, and so we left it in that way. For my own part, I would just as soon cut it out. The committee is not the only one to be considered, and that is why we left it in that indefinite way, so where engineers do require transverse expansion joints they can make them.

PRESIDENT HARDEE: We revert to the original motion that the report be adopted. All in favor of the adoption of the report will signify it by saying "Aye." Opposed "No." The report is adopted.

Now, Mr. Beaty, you made some suggestions; you can bring them up at this time in some form or other if you desire to do so.

MR. BEATY: I will be very glad to bring them up.

PRESIDENT HARDEE: You were discussing them a while ago. I think it would be in order for you to now move the addition of your suggestions to the report, provided the convention will agree to do that.

MR. BEATY: I do, yes.

PRESIDENT HARDEE: Is there any second to that motion?
Motion seconded.

MR. CHRIST: I would say to put it in the way of a recommendation to the association, and have each member take up the matter and report to the chairman his findings in regard to it. Instead of reporting it as a specification, simply put it as a recommendation for the members to investigate.

MR. TILLSON: Why not refer it to the next committee when appointed.

PRESIDENT HARDEE: Suppose, Mr. Beaty, instead of having your motion read that this be made as an addition to the report, that it come as a suggestion from you which will be printed right behind the report, and then it will come up at the next meeting.

MR. ALLEN: I move that this suggestion of Mr. Beaty's be referred to the Committee on Cement and Concrete Pavements for its consideration.

Motion seconded.

PRESIDENT HARDEE: You have all heard the motion. It has been seconded. Are there any objections? The Chair hears none. So ordered.

See page 119.

Mr. Kinney, I think, had some suggestions to make.

MR. KINNEY: What I said before can follow in the same manner as Mr. Beaty's suggestion.

PRESIDENT HARDEE: I must confess I am not thoroughly acquainted with the membership. Do you represent a city, Mr. Kinney?

MR. KINNEY: No, I represent an Associate Member.

PRESIDENT HARDEE: Then you have no right to make a motion; you are only privileged to take part in discussions.

MR. KINNEY: It is only made as a suggestion.

MR. KINGSLEY: I don't think that there is a single thing to Mr. Kinney's suggestion, but in order that he may have fair play, I move that it be referred to the committee in the same manner.

PRESIDENT HARDEE: It has been moved and seconded that the suggestions of Mr. Kinney be treated the same as those of Mr. Beaty. Does the Chair hear any objection to that motion? The Chair hears none. It is so ordered.

See page 127.

MR. RICHARDSON: I call attention to the fact that the tests applied to limestones would not apply to trap rock.

PRESIDENT HARDEE: The committee will pass on that, Mr. Richardson.

The following is the amended and adopted

REPORT OF THE COMMITTEE
ON
CEMENT AND CONCRETE PAVING SPECIFICATIONS.

Pittsburgh, Pa., February 27, 1913.

To the President and Members of the
Association for Standardizing
Paving Specifications.

Your Committee on Cement and Concrete Paving Specifications have considered all proposed amendments, and alterations to the different cement and concrete specifications, have heard all speakers who desired to appear before us, and have made such changes in the specifications adopted at New Orleans as in our judgment would tend to give the best general results.

CEMENT.

Under this head, the Committee decided to recommend the adoption of the Standard Specifications for Portland Cement, adopted by the American Society for Testing Material, August 16, 1909, with subsequent amendments.

All tests to be made in accordance with methods contained in report of Committee on Uniform Tests of Cement of the American Society of Civil Engineers, presented at the Annual Meeting, January 18, 1911, with subsequent amendments.

STANDARD SPECIFICATIONS AND UNIFORM METHODS OF
TESTING AND ANALYSIS FOR PORTLAND CEMENT.

Embracing the Report of the Committee on Standard Specifications for Cement of the American Society for Testing Materials; the Report of the Committee on Uniform Tests of Cement of the American Society of Civil Engineers; and the Report of the Committee on Uniformity in Technical Analysis for Limestone, Raw Mixtures and Portland Cements of the Society for Chemical Industry (New York Section).

Authorized reprint from the copyrighted Proceedings of the American Society for Testing Materials.

STANDARD SPECIFICATIONS FOR PORTLAND CEMENT.

ADOPTED BY THE AMERICAN SOCIETY FOR TESTING MATERIALS,

AUGUST 16, 1909.

GENERAL OBSERVATIONS.

These remarks have been prepared with a view of pointing out the pertinent features of the various requirements and the precautions to be observed in the interpretation of the results of the tests.

The Committee would suggest that the acceptance or rejection under these specifications be based on tests made by an experienced person having the proper means for making the tests.

SPECIFIC GRAVITY.

Specific gravity is useful in detecting adulteration. The results of tests of specific gravity are not necessarily conclusive as an indication of the quality of a cement, but when in combination with the results of other tests may afford valuable indications.

FINENESS.

The sieves should be kept thoroughly dry.

TIME OF SETTING.

Great care should be exercised to maintain the test pieces under as uniform conditions as possible. A sudden change or wide range of temperature in the room in which the tests are made, a very dry or humid atmosphere, and other irregularities vitally affect the rate of setting.

CONSTANCY OF VOLUME.

The tests for constancy of volume are divided into two classes, the first normal, the second accelerated. The latter should be regarded as a precautionary test only, and not infallible. So many conditions enter into the making and interpreting of it that it should be used with extreme care.

In making the pats the greatest care should be exercised to avoid initial strains due to molding or to too rapid drying-out during the first twenty-four hours. The pats should be preserved under the most uniform conditions possible, and rapid changes of temperature should be avoided.

The failure to meet the requirements of the accelerated tests need not be sufficient cause for rejection. The cement may, however, be held for twenty-eight days, and a retest made at the end of that period, using a new sample. Failure to meet the requirements at this time should be considered sufficient cause for rejection, although in the present state of our knowledge it cannot be said that such failure necessarily indicates unsoundness, nor can the cement be considered entirely satisfactory simply because it passes the tests.

SPECIFICATIONS.

GENERAL CONDITIONS.

All cement shall be inspected.

Cement may be inspected either at the place of manufacture or on the work.

In order to allow ample time for inspecting and testing, the cement should be stored in a suitable weather-tight building having the floor properly blocked or raised from the ground.

The cement shall be stored in such a manner as to permit easy access for proper inspection and identification of each shipment.

Every facility shall be provided by the contractor and a period of at least twelve days allowed for the inspection and necessary tests.

Cement shall be delivered in suitable packages with the brand and name of manufacturer plainly marked thereon.

A bag of cement shall contain 94 pounds of cement net. Each barrel of Portland cement shall contain 4 bags, and each barrel of natural cement shall contain 3 bags of the above net weight.

Cement failing to meet the seven-day requirements may be held awaiting the results of the twenty-eight day tests before rejection.

All tests shall be made in accordance with the methods proposed by the Committee on Uniform Tests of Cement of the American Society of Civil Engineers, presented to the Society January 21, 1903, and amended January 20, 1904, and January 15, 1908, with all subsequent amendments thereto.

The acceptance or rejection shall be based on the following requirements:

PORTLAND CEMENT.

Definition—This term is applied to the finely pulverized product resulting from the calcination to incipient fusion of an intimate mixture of properly proportioned argillaceous and calcareous materials, and to which no addition greater than 3% has been made subsequent to calcination.

SPECIFIC GRAVITY.

The specific gravity of cement shall not be less than 3.10. Should the test of cement as received fall below this requirement, a second test may be made upon a sample ignited at a low red heat. The loss in weight of the ignited cement shall not exceed 4 per cent.

FINENESS.

It shall leave by weight a residue of not more than 8% on the No. 100, and not more than 25% on the No. 200 sieve.

TIME OF SETTING.

It shall not develop initial set in less than thirty minutes; and must develop hard set in not less than one hour, nor more than ten hours.

TENSILE STRENGTH.

The minimum requirements for tensile strength for briquettes one square inch in cross section shall be as follows and the cement shall show no retrogression in strength within the periods specified:

NEAT CEMENT.

Age

24 hours in moist air.....	175 pounds
7 days (1 day in moist air, 6 days in water).....	500 pounds
28 days (1 day in moist air, 27 days in water).....	600 pounds

ONE PART CEMENT, THREE PARTS STANDARD OTTAWA SAND.

7 days (1 day in moist air, 6 days in water).....	200 pounds
28 days (1 day in moist air, 27 days in water).....	275 pounds

CONSTANCY OF VOLUME.

Pats of neat cement about three inches in diameter, one-half inch thick at the center, and tapering to a thin edge, shall be kept in moist air for a period of twenty-four hours.

(a) A pat is then kept in air at normal temperature and observed at intervals for at least 28 days.

(b) Another pat is kept in water maintained as near 70 degrees Fahr. as practicable, and observed at intervals for at least 28 days.

(c) A third pat is exposed in any convenient way in an atmosphere of steam above boiling water, in a loosely closed vessel for five hours.

These pats, to satisfactorily pass the requirements, shall remain firm and hard and show no signs of distortion, checking, cracking, or disintegrating.

SULPHURIC ACID AND MAGNESIA.

The cement shall not contain more than 1.75% of anhydrous sulphuric acid (SO_3), nor more than 4% of magnesia (MgO).

REPORT OF COMMITTEE ON UNIFORM TESTS OF CEMENT OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

PRESENTED AT THE ANNUAL MEETING, JANUARY 18, 1911.

Your Committee on Uniform Tests of Cement presents the following report:

SAMPLING.

1. *Selection of Sample*—The selection of the sample for testing is a detail that must be left to the discretion of the Engineer; the number and the quantity to be taken from each package will depend largely on the importance of the work, the number of tests to be made and the facilities for making them.

2. The sample shall be a fair average of the contents of the package; it is recommended that, where conditions permit, one barrel in every ten be sampled.

3. Samples should be passed through a sieve having twenty meshes per linear inch, in order to break up lumps and remove foreign material; this is also a very effective method for mixing them together in order to obtain an average. For determining the characteristics of a shipment of cement, the individual samples may be mixed and the average tested; where time will permit, however, it is recommended that they be tested separately.

4. *Method of Sampling*—Cement in barrels should be sampled through a hole made in the center of one of the staves, midway between the heads, or in the head, by means of an augur or a sampling iron similar to that used by sugar inspectors. If in bags, it should be taken from surface to center.

CHEMICAL ANALYSIS.

5. *Significance*—Chemical analysis may render valuable service in the detection of adulteration of cement with considerable amounts of inert material, such as slag or ground limestone. It is of use, also, in

determining whether certain constituents, believed to be harmful when in excess of a certain percentage, as magnesia and sulphuric anhydride, are present in inadmissible proportions.

6. The determination of the principal constituents of cement—silica, alumina, iron oxide and lime—is not conclusive as an indication of quality. Faulty character of cement results more frequently from imperfect preparation of the raw material or defective burning than from incorrect proportions of the constituents. Cement made from very finely-ground material, and thoroughly burned, may contain much more lime than the amount usually present, and still be perfectly sound. On the other hand, cements low in lime may, on account of careless preparation of the raw material, be of dangerous character. Further, the ash of the fuel used in burning may so greatly modify the composition of the products as largely to destroy the significance of the results of analysis.

7. *Method*—As a method to be followed for the analysis of cement, that proposed by the Committee on Uniformity in the Analysis of Materials for the Portland Cement Industry, of the New York Section of the Society for Chemical Industry, and published in *Engineering News*, Vol. 50, p. 60, 1903; and in *The Engineering Record*, Vol. 48, p. 49, 1903, is recommended.

SPECIFIC GRAVITY.

8. *Significance*—The specific gravity of cement is lowered by adulteration and hydration, but the adulteration must be in considerable quantity to affect the results appreciably.

9. Inasmuch as the differences in specific gravity are usually very small, great care must be exercised in making the determination.

10. *Apparatus and Method*—The determination of specific gravity is most conveniently made with Le Chatelier's apparatus. This consists of a flask (*D*), Fig. 1, of 120 cu. cm. (7.32 cu. in.) capacity, the neck of which is about 20 cm. (7.87 in.) long; in the middle of this neck is a bulb (*C*), above and below which are two marks (*F*) and (*E*); the volume between these marks is 20 cu. cm. (1.22 cu. in.). The neck has a diameter of about 9 mm. (0.35 in.), and is graduated into tenths of cubic centimeters above the mark (*F*).

11. Benzine (62° Baumé naphtha), or kerosene free from water, should be used in making the determination.

12. The specific gravity is determined as follows:

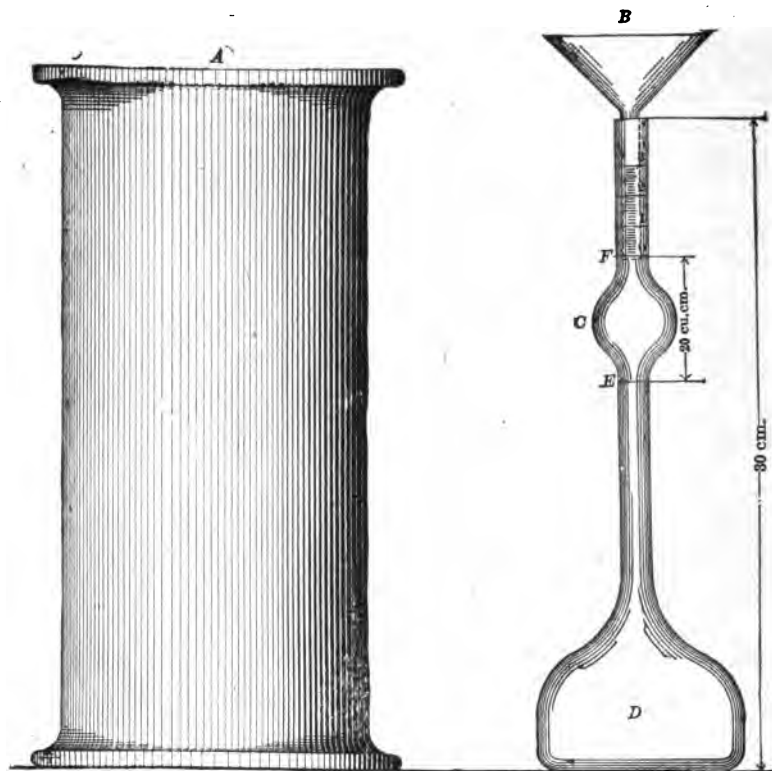
The flask is filled with either of these liquids to the lower mark (*E*), and 64 g. (2.25 oz.) of powder, cooled to the temperature of the liquid, is gradually introduced through the funnel (*B*) [the stem of which extends into the flask at the top of the bulb (*C*)], until all the powder is introduced, and the level of the liquid rises to some division of the graduated neck. This reading plus 20 cu. cm. is the volume displaced by 64 g. of powder.

13. The specific gravity is then obtained from the formula:

Weight of Cement, in grammes.

Specific Gravity $\frac{\text{Weight of Cement, in grammes.}}{\text{Displaced Volume, in cubic centimeters.}}$

Displaced Volume, in cubic centimeters.



LE CHATELIER'S SPECIFIC GRAVITY APPARATUS.

FIG. 1.

14. The flask, during the operation, is kept immersed in water in a jar (A), in order to avoid variations in the temperature of the liquid. The results should agree within 0.01. The determination of specific gravity should be made on the cement as received; and, should it fall below 3.10, a second determination should be made on the sample ignited at a low red heat.

15. A convenient method for cleaning the apparatus is as follows: The flask is inverted over a large vessel, preferably a glass jar, and shaken vertically until the liquid starts to flow freely; it is then held still in a vertical position until empty; the remaining traces of cement can be removed in a similar manner by pouring into the flask a small quantity of clean liquid benzine or kerosene and repeating the operation.

FINENESS.

16. *Significance.*—It is generally accepted that the coarser particles in cement are practically inert, and it is only the extremely fine powder that possesses adhesive or cementing qualities. The more finely cement is pulverized, all other conditions being the same, the more sand it will carry and produce a mortar of a given strength.

17. The degree of final pulverization which the cement receives at the place of manufacture is ascertained by measuring the residue retained on certain sieves. Those known as the No. 100 and No. 200 sieves are recommended for this purpose.

18. *Apparatus.*—The sieves should be circular, about 20 cm. (7.87 in.) in diameter, 6 cm. (2.36 in.) high, and provided with a pan, 5 cm. (1.97 in.) deep, and a cover.

19. The wire cloth should be of brass wire having the following diameters:

No. 100, 0.0045 in.; No. 200, 0.0024 in.

20. This cloth should be mounted on the frames without distortion; the mesh should be regular in spacing and be within the following limits:

No. 100, 96 to 100 meshes to the linear inch.

No. 200, 188 to 200 meshes to the linear inch.

21. Fifty grammes (1.76 oz.) or 100 g. (3.52 oz.) should be used for the test, and dried at a temperature of 100 degrees cent. (212 degrees Fahr.) prior to sieving.

22. *Method.*—The thoroughly dried and coarsely screened sample is weighed and placed on the No. 200 sieve, which, with pan and cover attached, is held in one hand in a slightly inclined position, and moved forward and backward, at the same time striking the side gently with the palm of the other hand, at the rate of about 200 strokes per minute. The operation is continued until not more than one-tenth of 1% passes through after one minute of continuous sieving. The residue is weighed, then placed on the No. 100 sieve and the operation repeated. The work may be expedited by placing in the sieve a small quantity of large steel shot. The results should be reported to the nearest tenth of 1 %.

NORMAL CONSISTENCY.

23. *Significance.*—The use of a proper percentage of water in making the pastes* from which pats, tests of setting, and briquettes are made, is exceedingly important, and affects vitally the results obtained.

24. The determination consists in measuring the amount of water required to reduce the cement to a given state of plasticity or to what is usually designated the normal consistency.

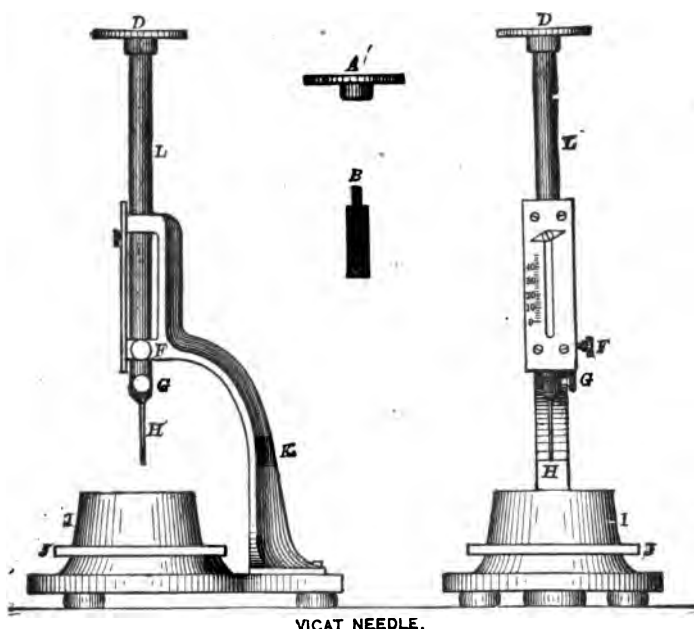
25. The Committee recommends the following method for determining normal consistency:

26. *Method. Vicat Needle Apparatus.*—This consists of a frame (K), Fig. 2, bearing a movable rod (L), with a cap (A) at one end, and at the other the cylinder (B), 1 cm. (0.39 in.) in diameter, the cap, rod

*The term "paste" is used in this report to designate a mixture of cement and water, and the word "mortar," a mixture of cement, sand and water.

and cylinder weighing 300 g. (10.58 oz.). The rod, which can be held in any desired position by a screw (*F*), carries an indicator, which moves over a scale (graduated to centimeters) attached to the frame (*K*). The paste is held by a conical, hard-rubber ring (*I*), 7 cm. (2.76 in.) in diameter at the base, 4 cm. (1.57 in.) high, resting on a glass plate (*J*), about 10 cm. (3.94 in.) square.

27. In making the determination, the same quantity of cement as will be subsequently used for each batch in making the briquettes, but not less than 500 g., is kneaded into a paste, as described in Paragraph 52, and quickly formed into a ball with the hands, completing the operation by tossing it six times from one hand to the other, maintained 6 in. apart;



VICAT NEEDLE.

FIG. 2.

the ball is then pressed into the rubber ring, through the larger opening, smoothed off, and placed (on its large end) on a glass plate and the smaller end smoothed off with a trowel; the paste, confined in the ring, resting on the plate, is placed under the rod bearing the cylinder, which is brought in contact with the surface and quickly released.

28. The paste is of normal consistency when the cylinder in one minute from the time it is released penetrates to a point in the mass 10 mm. (0.39 in.) below the top of the ring. Great care must be taken to fill the ring exactly to the top. The apparatus must be free from all vibrations during the test.

29. The trial pastes are made with varying percentages of water until the correct consistency is obtained.

30. The Committee has recommended, as normal, a paste, the consistency of which is rather wet, because it believes that variations in the

amount of compression to which the briquette is subjected in moulding are likely to be less with such a paste.

31. Having determined in this manner the proper percentage of water required to produce a paste of normal consistency, the proper percentage required for the mortars is obtained from the table below:

PERCENTAGE OF WATER FOR STANDARD MORTARS.

Neat	One Cement, three standard Ottawa sand.	Neat	One cement, three standard Ottawa sand.	Neat	One cement, three standard Ottawa sand.
15	8.0	23	9.3	31	10.7
16	8.2	24	9.5	32	10.8
17	8.3	25	9.7	33	11.0
18	8.5	26	9.8	34	11.2
19	8.7	27	10.0	35	11.5
20	8.8	28	10.2	36	11.5
21	9.0	29	10.3	37	11.7
22	9.2	30	10.5	38	11.8

TIME OF SETTING.

32. *Significance.*—The object of this test is to determine the time which elapses from the moment water is added until the paste ceases to be fluid and plastic (called the “initial set”), and also the time required for it to acquire a certain degree of hardness (called the “final” or “hard set”). The former of these is the more important, since, with the commencement of setting, the process of crystallization or hardening is said to begin. As a disturbance of this process may produce a loss of strength, it is desirable to complete the operation of mixing and moulding or incorporating the mortar into the work before the cement begins to set.

33. It is usual to measure arbitrarily the beginning and end of the setting by the penetration of weighted wires of given diameters.

34. *Method.*—For this purpose the Vicat Needle, which has already been described in Paragraph 26, should be used.

35. In making the test, a paste of normal consistency is moulded and placed under the rod (*L*), Fig. 2, as described in Paragraph 27, this rod bearing the cap (*D*) at one end and the needle (*H*), 1 mm. (0.039 in.) in diameter, at the other, weighing 300 g. (10.58 oz.). The needle is then carefully brought in contact with the surface of the paste and quickly released.

36. The setting is said to have commenced when the needle ceases to pass a point 5 mm. (0.20 in.) above the upper surface of the glass plate, and is said to have terminated the moment the needle does not sink visibly into the mass.

37. The test pieces should be stored in moist air during the test; this is accomplished by placing them on a rack over water contained in a pan and covered with a damp cloth, the cloth to be kept away from them by means of a wire screen; or they may be stored in a moist box or closet.

38. Care should be taken to keep the needle clean, as the collection of cement on the sides of the needle retards the penetration, while cement on the point reduces the area and tends to increase the penetration.

39. The determination of the time of setting is only approximate, being materially affected by the temperature of the mixing water, the temperature and humidity of the air during the test, the percentage of water used, and the amount of kneading the paste receives.

STANDARD SAND.

40. The Committee recommends the natural sand from Ottawa, Ill., screened to pass a sieve having 20 meshes per linear inch and retained on a sieve having 30 meshes per linear inch the wires to have diameters of 0.0165 and 0.0112 in., respectively, *i. e.*, half the width of the opening in each case. Sand having passed the No. 20 sieve shall be considered standard when not more than 1% passes a No. 30 sieve after one minute's continuous sifting of a 500-g. sample.*

FORM OF TEST PIECES.

41. For tension tests the Committee recommends the form of test piece shown in Fig. 3.

42. For compression tests a 2-in. cube is recommended.

MOULDS.

43. The moulds should be made of brass, bronze, or some equally non-corrodible material, having sufficient metal in the sides to prevent spreading during moulding.

44. Gang moulds, which permit moulding a number of briquettes at one time, are preferred by many to single moulds; since the greater quantity of mortar that can be mixed tends to produce greater uniformity in the results. The type shown in Fig. 4 is recommended.

45. The moulds should be wiped with an oily cloth before using.

MIXING.

46. All proportions should be stated by weight; the quantity of water to be used should be stated as a percentage of the dry material.

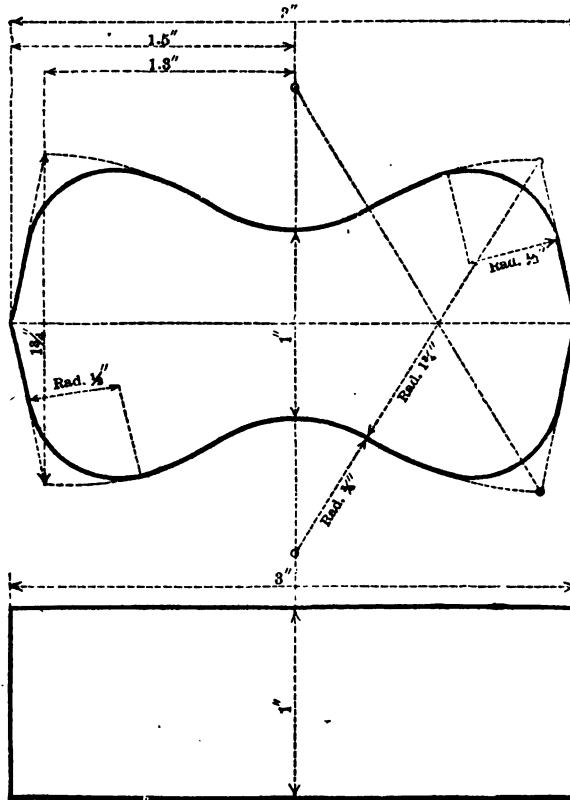
47. The metric system is recommended because of the convenient relation of the gramme and the cubic centimeter.

48. The temperature of the room and the mixing water should be as near 21 degrees cent. (70 degrees Fahr.) as it is practicable to maintain it.

49. The sand and cement should be thoroughly mixed dry. The mixing should be done on some non-absorbing surface, preferably plate glass. If the mixing must be done on an absorbing surface it should be thoroughly dampened prior to use.

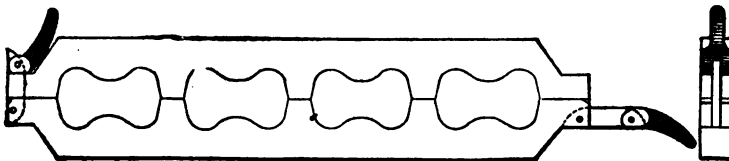
*This sand may be obtained from the Ottawa Silica Company at a cost of two cents per pound, f. o. b. cars, Ottawa, Ill.

50. The quantity of material to be mixed at one time depends on the number of test pieces to be made; about 1,000 g. (35.28 oz.) makes a convenient quantity to mix, especially by hand methods.



DETAILS FOR BRIQUETTE.

FIG. 3.



DETAILS FOR GANG MOULD.

FIG. 4.

51. The Committee, after investigation of the various mechanical mixing machines, has decided not to recommend any machine that has thus far been devised for the following reasons:

1000

(1) The tendency of most cement is to "ball up" in the machine, thereby preventing the working of it into a homogeneous paste; (2) there is no means of ascertaining when the mixing is complete without stopping the machine, and (3) the difficulty of keeping the machine clean.

52. *Method.*—The material is weighed and placed on the mixing table, and a crater formed in the center, into which the proper percentage of clean water is poured; the material on the outer edge is turned into the crater by the aid of a trowel. As soon as the water has been absorbed, which should not require more than one minute, the operation is completed by vigorously kneading with the hands for an additional one minute, the process being similar to that used in kneading dough. A sand-glass affords a convenient guide for the time of kneading. During the operation of mixing, the hands should be protected by gloves, preferably of rubber.

MOULDING.

53. Having worked the paste or mortar to the proper consistency, it is at once placed in the moulds by hand.

54. The Committee has been unable to secure satisfactory results with the present moulding machines; the operation of machine moulding is very slow, and the present types permit of moulding but one briquette at a time, and are not practicable with the pastes or mortars herein recommended.

55. *Method.*—The moulds should be filled immediately after the mixing is completed, the material pressed in firmly with the fingers and smoothed off with a trowel without mechanical ramming; the material should be heaped up on the upper surface of the mould, and, in smoothing off, the trowel should be drawn over the mould in such a manner as to exert a moderate pressure on the excess material. The mould should be turned over and the operation repeated.

56. A check upon the uniformity of the mixing and moulding is afforded by weighing the briquettes just prior to immersion, or upon removal from the moist closet. Briquettes which vary in weight more than 3% from the average should not be tested.

STORAGE OF THE TEST PIECES.

57. During the first 24 hours after moulding, the test pieces should be kept in moist air to prevent them from drying out.

58. A moist closet or chamber is so easily devised that the use of the damp cloth should be abandoned. Covering the test pieces with a damp cloth is objectionable, as commonly used, because the cloth may dry out unequally, and, in consequence, the test pieces are not all maintained under the same condition. Where a moist closet is not available, a cloth may be used and kept uniformly wet by immersing the ends in water. It should be kept from direct contact with the test pieces by means of a wire screen or some similar arrangement.

59. A moist closet consists of a soapstone or slate box or a metal-lined wooden box—the metal lining being covered with felt and this felt kept wet. The bottom of the box is so constructed as to hold water, and the sides are provided with cleats for holding glass shelves on which

to place the briquettes. Care should be taken to keep the air in the closet uniformly moist.

60. After 24 hours in moist air, the test pieces for longer periods of time should be immersed in water maintained as near 21° cent. (70° Fahr.) as practicable; they may be stored in tanks or pans, which should be of non-corrodible material.

TENSILE STRENGTH.

61. The tests may be made on any machine. A solid metal clip, as shown in Fig. 5, is recommended. This clip is to be used without cush-

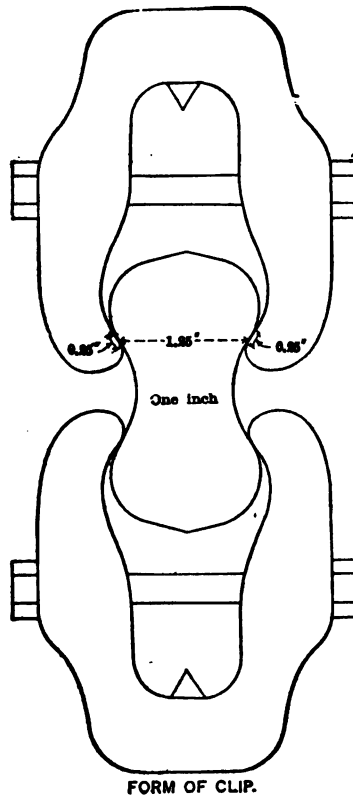


FIG 5.

ioning at the points of contact with the test specimen. The bearing at each point of contact should be $\frac{1}{4}$ inch wide, and the distance between the center of contact on the same clip should be $1\frac{1}{4}$ inches.

62. Test pieces should be broken as soon as they are removed from the water. Care should be observed in centering the briquettes in the

testing machine, as cross-strains, produced by improper centering, tend to lower the breaking strength. The load should not be applied too suddenly, as it may produce vibration, the shock from which often breaks the briquettes before the ultimate strength is reached. Care must be taken that the clips and the sides of the briquette be clean and free from grains of sand or dirt, which would prevent a good bearing. The load should be applied at the rate of 600 pounds per minute. The average of the briquettes of each sample tested should be taken as the test, excluding any results which are manifestly faulty.

CONSTANCY OF VOLUME.

63. *Significance.*—The object is to develop those qualities which tend to destroy the strength and durability of a cement. As it is highly essential to determine such qualities at once, tests of this character are for the most part made in a very short time, and are known, therefore, as accelerated tests. Failure is revealed by cracking, checking, swelling, or disintegration, or all of these phenomena. A cement which remains perfectly sound is said to be of constant volume.

64. *Methods.*—Tests for constancy of volume are divided into two classes: (1) normal tests, or those made in either air or water maintained at about 21° cent. (70° Fahr.), and (2) accelerated tests, or those made in air, steam or water at a temperature of 45° cent. (113° Fahr.) and upward. The test pieces should be allowed to remain 24 hours in moist air before immersion in water or steam, or preservation in air.

65. For these tests, pats about $7\frac{1}{2}$ cm. (2.95 inches) in diameter, $1\frac{1}{4}$ cm. (0.49 inch) thick at the center, and tapering to a thin edge, should be made, upon a clean glass plate [about 10 cm. (3.94 inches) square], from cement paste of normal consistency.

66. *Normal Test.*—A pat is immersed in water maintained as near 21° cent. (70° Fahr.) as possible for 28 days, and observed at intervals. A similar pat, after 24 hours in moist air, is maintained in air at ordinary temperature and observed at intervals.

67. *Accelerated Test.*—A pat is placed in an atmosphere of steam upon a wire screen 1 inch above boiling water for five (5) hours. The apparatus should be so constructed as to permit the free escape of steam and maintain atmospheric pressure. Since the type of apparatus used has a great influence on the uniformity of the results, that shown in Fig. 8 is recommended.

68. To pass these tests satisfactorily, the pats should remain firm and hard, and show no signs of cracking, distortion or disintegration.

69. Should the pat leave the plate, distortion may be detected best with a straight-edge applied to the surface which was in contact with the plate.

COPPER BOILER

Boiler to be made of sheet copper weighing 22 oz. per sq. ft., tinned inside.
All seams to be lapped where possible. Hard solder to be used only

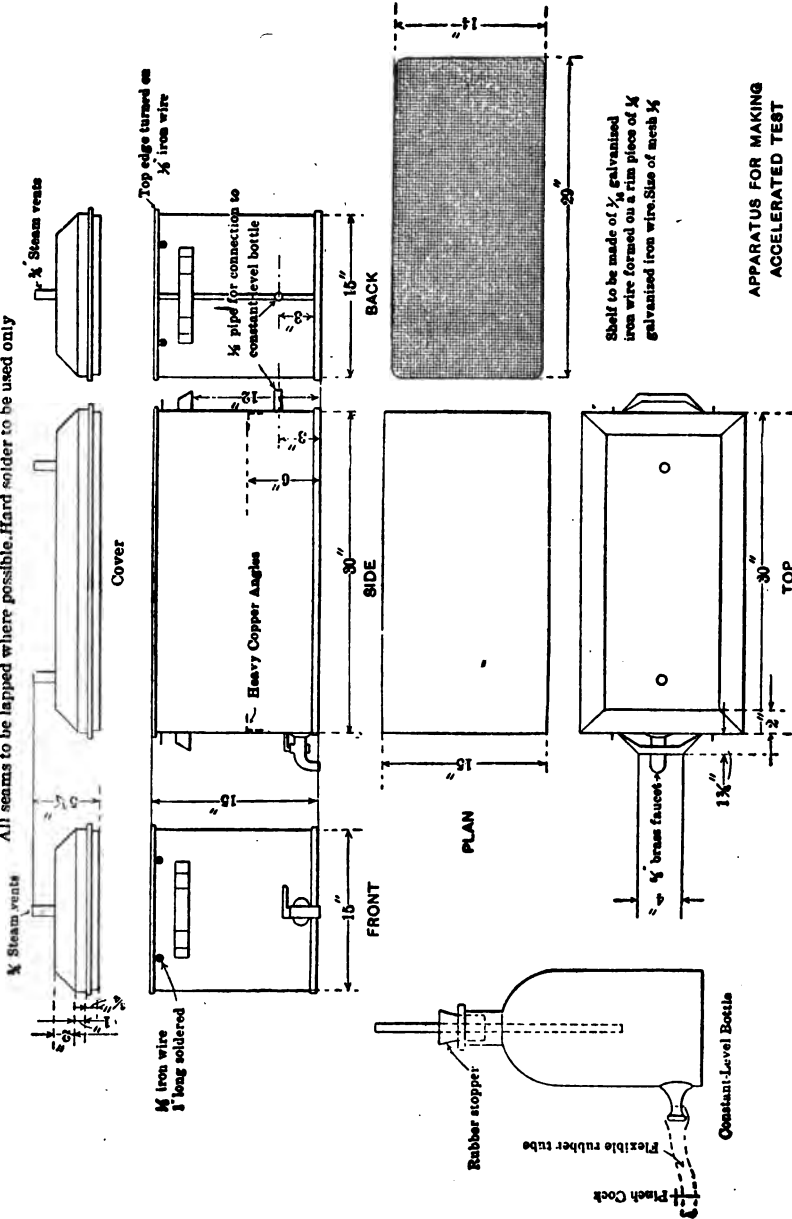


Fig. 6.

To be made of sheet copper weighing 22 oz. per sq. ft., tinned inside.
All seams to be lapped where possible. Hard solder only to be used.

70. In the present state of our knowledge it cannot be said that cement should necessarily be condemned simply for failure to pass the accelerated tests; nor can a cement be considered entirely satisfactory simply because it has passed these tests.

Submitted on behalf of the Committee,

GEORGE S. WEBSTER,
Chairman.

RICHARD L. HUMPHREY,
Secretary.

JANUARY 18TH, 1911.

Committee.

GEORGE S. WEBSTER,
RICHARD L. HUMPHREY,
GEORGE F. SWAIN,
ALFRED NOBLE,
LOUIS C. SABIN,
S. B. NEWBERRY,
CLIFFORD RICHARDSON,
W. B. W. HOWE,
F. H. LEWIS.

SPECIFICATIONS FOR CONCRETE SIDEWALKS.

CEMENT.

As heretofore recommended in Cement Specifications.

FINE AGGREGATE.

The fine aggregate shall consist of any material of siliceous, granitic or igneous origin, free from mica in excess of five (5) per cent, and other impurities, and shall be of graded sizes ranging from $\frac{1}{4}$ inch down to that which shall be retained on a No. 100 Standard Sieve, not more than 20 per cent of which will pass a No. 50 Standard Sieve for the base; and from $\frac{1}{4}$ inch down to that which will be retained on a No. 80 Standard Sieve, not more than 20 per cent of which shall pass a No. 50 Standard Sieve for the top of wearing surface.

COARSE AGGREGATE.

The coarse aggregate shall be sound gravel, broken stone or slag having a specific gravity of not less than 2.6. It shall be free from all foreign matter, uniformly graded and of sizes that will pass a one (1) inch screen and be retained on a quarter ($\frac{1}{4}$) inch screen.

WATER.

The water used in mixing the concrete shall be clean, free from oil, acid, alkalis or vegetable matter.

BASE PROPORTIONS.

In preparing the concrete for the base, the cement and aggregate shall be measured separately, and then mixed in such proportion that the resulting concrete shall contain fine aggregate amount of one-half

($\frac{1}{2}$) of volume of the coarse aggregate; and that five and one-half cubic feet of concrete in place shall contain ninety-four (94) pounds of cement.

THICKNESS.

The base shall be — inches in thickness, with its upper surface finished parallel to and — inch below the grade of the finished sidewalk. The minimum thickness for base shall be three inches.

MIXING.

The ingredients of the concrete shall be thoroughly mixed, sufficient water being added to obtain the desired consistency, and the mixing continued until the materials are uniformly distributed and each particle of the fine aggregate is thoroughly coated with cement, and each particle of the coarse aggregate is thoroughly coated with mortar.

Where a mechanical concrete mixer is used, the materials must be proportioned dry, and then deposited in the mixer all at the same time. The mixer must produce a concrete of uniform consistency and color with the stones thoroughly mixed with the water, sand and cement.

CONSISTENCY.

The materials shall be mixed to produce a concrete of such consistency that the water will flush to the surface under heavy tamping.

RE-TEMPERING.

Re-tempering, that is, re-mixing with additional water, mortar or concrete that has partially hardened, will not be permitted.

FORMS.

1. The forms shall be smooth, free from warp, of sufficient strength to resist springing out of shape, and of depth to conform to the thickness of the proposed walk.

2. All mortar and dirt shall be removed from forms that have been previously used.

3. The forms shall be well staked and thoroughly braced, and set to the established lines, their upper edges conforming to the grade of the finished walk, which shall have sufficient fall from the lot line towards the curb line to provide for drainage, but shall not exceed $\frac{3}{8}$ inch per foot.

4. The base shall be blocked out in sections which shall not measure more than six feet in any dimension.

5. The cross forms shall be of $\frac{1}{4}$ inch metal, of a depth to correspond to the thickness of the proposed walk, and shall extend full width of the walk and be set at right angles to the side forms. They shall be left in place until the wearing surface is floated.

6. Wood forms shall be moistened before concrete is placed.

DRAINAGE.

The sub-base, or that portion of the base under the concrete, shall be properly drained.

PLACING CONCRETE.

1. The concrete shall be deposited in a layer on the sub-grade in such quantities that, after being thoroughly rammed in place, it will be of the required thickness, and the upper surface shall be true, uniform and parallel with the surface of the finished sidewalk.

2. In conveying the concrete from the place of mixing to the place of deposit, the operation must be conducted in such a manner that no mortar will be lost, and the concrete must be so handled that the foundation will be of uniform composition throughout, showing no excess nor lack of mortar in any place.

TOP OR WEARING SURFACE.

1. The top or wearing surface shall be composed of one part Portland Cement and two parts fine aggregate, mixed with sufficient water to produce a mortar of a consistency which will not require tamping and which can be easily spread into position with a straight edge.

2. The mortar for the wearing surface shall be mixed in a mortar box and spread on the base immediately after mixing. In no case shall more than forty-five minutes elapse between the mixing of the concrete for the base and the covering of same with the wearing surface.

3. After the wearing surface has been worked to an approximately true plane, the slab marking shall be made directly over the joint and the base. Such marking shall be made with a tool which will cut entirely through and completely separate the surface of adjacent slabs.

THICKNESS.

The wearing surface shall be — inch in thickness.

The minimum thickness for wearing surface shall be three-fourths ($\frac{3}{4}$) inch.

EDGES.

The slabs shall be rounded on all surface edges to a radius of about one-half inch.

TROWELING.

After the wearing surface has been brought to the established grade, it shall be worked with a wood float in a manner that will thoroughly compact it. When required, the surface shall be troweled smooth, but excessive working with a steel trowel shall be avoided. The application of neat cement to the surface in order to hasten hardening is prohibited.

PROTECTION.

When completed, the walks shall be kept moist and protected from traffic and elements for at least three days.

FREEZING TEMPERATURE.

No concrete shall be mixed while the air temperature is below 32 degrees F., and in no case shall any materials containing frost be used; and if this temperature is reached at any time before the wearing sur-

face is laid, the foundation or other concrete shall be immediately provided with such covering as will protect it from all damage.

In no event shall concrete walks be laid on a frozen foundation.

SPECIFICATIONS FOR CONCRETE CURB AND COMBINED CURB AND GUTTER.

CEMENT.

As heretofore recommended in cement specifications.

FINE AGGREGATE.

As heretofore recommended in sidewalk specifications.

COARSE AGGREGATE.

As heretofore recommended in sidewalk specifications.

WATER.

As heretofore recommended in sidewalk specifications.

BASE PROPORTIONS.

As heretofore recommended in sidewalk specifications.

DIMENSIONS.

The curb or combined curb and gutter shall conform to the plans for same attached. The curbing shall be — inches thick by — inches deep. Curb and gutter shall show a curb — inch thick, with face as shown on plans. The gutter shall be — inches wide and — inches thick, and due allowance shall be made in placing to allow for the facing or wearing surface, which shall be — inch thick, as hereinafter stated. The minimum thickness of a curb shall be five inches. The minimum thickness of gutter shall be six inches.

MIXING.

As heretofore recommended in sidewalk specifications.

CONSISTENCY.

As heretofore recommended in sidewalk specifications.

RE-TEMPERING.

As heretofore recommended in sidewalk specifications.

FORMS.

1. The forms shall be smooth, free from warp, of sufficient strength to resist springing out of shape, and of a depth to conform to the depth of the proposed work.
2. Mortar and dirt shall be removed from forms that have been previously used.
3. The forms shall be well staked and thoroughly braced and set to the established lines, their upper edge conforming to the grade of the finished curb.

4. The sections for combined curb and gutter shall not measure more than six (6) feet in length nor less than four (4) feet when unprotected, and not more than ten (10) feet nor less than six (6) feet in length when protected.

5. The cross forms shall be of $\frac{1}{4}$ inch metal, of a depth to correspond to the depth of the proposed work, and shall extend full width of the work. They shall be left in place until the wearing surface is floated.

6. Wood forms shall be moistened before concrete is placed.

PLACING CONCRETE.

As heretofore recommended in sidewalk specifications.

FACING OR WEARING SURFACE.

1. As heretofore recommended in sidewalk specifications.

2. The mortar for the facing shall be mixed in a mortar box, and spread in place immediately after mixing. In no case shall more than forty-five minutes elapse between the mixing of the concrete for the base and the covering of same with the wearing surface.

The facing or wearing surface of the curb shall be placed on the inside of the form as the body of the curb is being built up.

3. As heretofore recommended in sidewalk specifications.

THICKNESS.

As heretofore recommended in sidewalk specifications.

TROWELING.

As heretofore recommended in sidewalk specifications.

PROTECTION.

When completed the work shall be kept moist for four days, and protected from traffic and the elements for at least ten days.

FREEZING TEMPERATURE.

1. As heretofore recommended in sidewalk specifications.

2. In no event shall a concrete curb or curb and gutter be laid on a frozen foundation.

CURB NOT BUILT IN PLACE.

Where built at a point removed from the work, they shall be constructed in the same manner and of the same material as above specified, and shall be allowed to harden for at least twenty-eight (28) days before being transported for their position in the work.

The length of any section shall not be less than four (4) feet nor more than six (6) feet.

SPECIFICATIONS FOR CONCRETE FOR PAVEMENT FOUNDATIONS.

CEMENT.

As heretofore recommended in cement specifications.

FINE AGGREGATE.

As heretofore recommended in sidewalk specifications.

COARSE AGGREGATE.

The coarse aggregate shall be sound gravel, broken stone or slag having a specific gravity of not less than 2.6. It shall be free from all foreign matter, uniformly graded, and shall range in size from $\frac{1}{4}$ inch up, the largest particles not to exceed in any dimension one-half the thickness of the concrete in place.

PROPORTIONS.

In preparing the concrete, the cement and the aggregate shall be measured separately and then mixed in such proportions that the resulting concrete shall contain fine aggregate amounting to one-half of the volume of the coarse aggregate; and that in no case shall less than one (1) bag [ninety-four (94) pounds] of cement be used for every six and one-half ($6\frac{1}{2}$) cubic feet of concrete in place.

MIXING.

As heretofore recommended in sidewalk specifications.

CONSISTENCY.

The materials shall be mixed wet enough to produce a concrete of a consistency that will flush readily under light tamping, but which can be handled without causing a separation of the coarse aggregate from the mortar.

PLACING CONCRETE.

As heretofore recommended in sidewalk specifications.

THICKNESS.

The foundation shall be — inches in thickness, with its upper surface finished parallel to and — inches below the grade of the finished pavement.

The standard thickness for concrete foundation shall be six (6) inches.

PROTECTION.

When complete, the foundation shall be kept moist for not less than three days, and it shall be protected from traffic until the concrete has thoroughly set.

FREEZING TEMPERATURE.

As heretofore recommended in sidewalk specifications.

SPECIFICATIONS FOR CONCRETE PAVEMENTS.

Your Committee recognizes the fact that there are several concrete pavements, including concrete pavements with a bituminous wearing surface, now in use, on which patents have been applied for. We consider it outside of the jurisdiction of this Committee to pass upon the bituminous treatment of the surface. If any municipality should desire to lay any of these pavements, the materials used in the work should conform to the requirements of these standard specifications.

We believe that there are conditions where traffic is light, and economy and cost are essential conditions where a concrete pavement may be used to advantage. In such cases, we recommend for your consideration the following specifications:

CEMENT.

As heretofore recommended in cement specifications.

FINE AGGREGATE.

As heretofore recommended in sidewalk specifications.

COARSE AGGREGATE.

As heretofore recommended in specifications for concrete pavement foundations.

PROPORTIONS.

In preparing the concrete the cement and aggregate shall be measured separately, and then mixed in such proportions that the resulting concrete shall contain fine aggregate amounting to one-half the volume of the coarse aggregate, and that in no case shall less than one (1) bag [ninety-four (94) pounds] of cement be used for every four (4) cubic feet of concrete in place.

MIXING.

As heretofore recommended in sidewalk specifications.

CONSISTENCY.

As heretofore recommended in specifications for concrete for pavement foundations.

RE-TEMPERING.

As heretofore recommended in sidewalk specifications.

PLACING CONCRETE.

1. The concrete shall be deposited in a layer on the sub-grade in such quantities that, after being thoroughly rammed in place, it will be of the required thickness, and the upper surface shall be true and uniform.
2. As heretofore recommended in sidewalk specifications.

THICKNESS.

The thickness of the pavement shall be — inches, with its upper surface on a finished grade.

The minimum thickness for concrete pavement shall be five and one-half inches.

FINISHING.

The pavement shall be finished by thorough hand tamping until the mortar flushes freely to the surface, and shaped to conform to the curvature of the finished pavement.

Where it is proposed to complete the pavement with a bituminous wearing surface, the surface of the pavement shall be lightly broomed at right angles to the curbing immediately after the tamping above specified has been completed.

EXPANSION JOINTS.

If desired, expansion joints shall be placed at right angles to the curb line at intervals of fifty feet.

All expansion joints must be filled flush with the surface of the concrete before the bituminous wearing surface is placed.

PROTECTION TO WORK.

During the first four days after placing, the pavement shall be kept moist and it shall be protected against traffic until the concrete has thoroughly set.

In no event shall the pavement be used within ten days after being laid.

FREEZING TEMPERATURE.

As heretofore recommended in sidewalk specifications.

GUARANTEE.

Your Committee recommends that a guarantee be required of the contractor for performing the contract. Further, that any guarantee for maintenance be on a reserve basis for a period of not exceeding two years' time.

All of which is respectfully submitted.

C. E. P. BABCOCK, Chairman,
First Assistant Engineer, Buffalo, N. Y.

TOM. M. REED, Vice Chairman,
Division Engineer, Street Improvements, Pitts-
burgh, Pa.

C. O. DAUGHADAY,
Division Superintendent, Bureau of Water,
Pittsburgh, Pa.

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PRES. HARDEE: We would now like to hear from the Chairman of the Committee on Macadam, Mr. H. H. Schmidt.

MR. SCHMIDT: (Reads report.)

MR. MACGREGOR: One word should be corrected under "Heating and Applying Binder," the first limits of temperature for tar cement, not coal tar cement, 225 to 300 degrees, page 8. We are specifying both water gas tar and coal tar.

MR. SCHMIDT: I move the adoption of the report.

VICE-PRES. TONSON (IN THE CHAIR): You have heard the report, gentlemen. It is moved and seconded that the report be adopted.

MR. KERSHAW: I would suggest a change in the box from $2\frac{1}{2}$ inches to $2\frac{1}{4}$.

VICE-PRES. TONSON: That was recommended in the Asphalt Committee, making a suitable box to contain fifty grams; the Asphalt Committee makes it $2\frac{1}{4}$ by $1\frac{3}{4}$.

MR. SCHMIDT: I will change that to agree with the report of the other Committees: $2\frac{1}{4}$ by $1\frac{3}{4}$.

VICE-PRES. TONSON: What is your pleasure with this report, gentlemen?

It is moved and seconded that the report of the Committee on Macadam be adopted. All in favor will signify by saying "Aye." Contrary minded "No." Carried.

Following is the amended and adopted

REPORT OF THE COMMITTEE
ON
MACADAM PAVING SPECIFICATIONS.

Pittsburgh, Pa., February 26, 1913.

To the President and Members of the
Association for Standardizing
Paving Specifications.

Your Committee on Macadam Specifications begs to submit the following revised specifications for bituminous macadam. This Committee does not agree with that part of the report submitted by last year's committee in which it is stated that "water-bound macadam pavement is not a proper permanent pavement." We believe that a well laid water-bound macadam pavement with a proper surface treatment is a desirable form of pavement under certain local and economic conditions.

The methods of building water-bound macadam pavements are well known and the Committee has insufficient time to prepare a specification at this meeting for the surface treatment.

It is, however, recommended when this form of construction is used that great care be exercised in the following matters:

1. Road must be well drained, filled and rolled.
2. Road to be opened to traffic and well seasoned before surface is treated.
3. Surface to be thoroughly cleaned before bitumen is applied.
4. The surface bitumen to consist of an application of asphaltic oil, coal tar or water gas tar, preferably applied by a pressure distributor.
5. After application of bituminous material a light coat of screenings or sand shall be spread over the surface.

SPECIFICATION FOR BITUMINOUS MACADAM
• PAVEMENT.

SUB-GRADE.

The Contractor will be required to do all of the grading necessary to bring the surface to the proper sub-grade as determined by the lines and grades given by the Engineer. If the material at sub-grade be of an unstable character and unfit for foundation, the Contractor shall make such additional excavation as may be determined by the Engineer and refill with approved material. After all necessary grading has been done to bring the surface to sub-grade, the street shall be thoroughly rolled with a road roller weighing not less than ten tons. If settlement occurs, the depression shall be filled and then re-rolled until the surface is solid, uniform and parallel with the grade and cross-section of the finished pavement. All filling shall be free from animal or vegetable matter and of a character approved by the Engineer. In cases of spongy

or yielding sub-grade, some other means besides ordinary rolling and sprinkling must be employed to obtain satisfactory compaction of the sub-grade. In the case of a loose, sandy soil a thorough wetting will often put it in a condition to be compacted under the roller. In the case of clay soils that puddle up and wave or creep under a continued rolling, it is best to roll as dry as possible and to be sparing in the use of water when rolling the first layer of macadam. Cinders, gravel or stone screenings will often help in rolling such sub-grades.

SUB-DRAINAGE.

When the soil is of such a character that it retains an excessive amount of moisture, such as clays, subject to swelling or heaving under the action of frost, or sands, similar to quicksand, that do not afford a ready natural drainage, sub-drains should be provided.

These may be of two general kinds: first, tile drains of open porous material or vitrified tile, laid with open joints; second, trenches filled with broken stone, gravel, cinders or other similar material.

In some cases it may be sufficient to construct a sub-drain on each side of the roadway at or near the lines of the gutters, but when the soil is of a very wet nature, it may be advisable to lay additional lines of drains which may be in or near the middle of the roadway. This system of drains may be varied by diagonal lines of drains running from near the crown of the roadway to the gutters.

The drains should have connections with existing sewers, catch-basins, or ditches.

MACADAM FOUNDATION.

If the pavement is to be laid on a new macadam foundation, it shall be built according to the standard specifications for macadam, as follows:

The total thickness of the macadam base will vary according to the character of soil, drainage, kind of stone available, etc. In general, the macadam base should be constructed of broken stone, which should be sound, hard and durable under traffic. The broken stone should be separated into different sizes by screening, the smaller sizes with the dust being used to fill and bond together the larger sizes. The thickness of the base should be regulated by experience in constructing ordinary water-bound macadam roads, in similar situations, the total thickness of pavement, including wearing surface, being made the same or a little less than well constructed macadam.

After the sub-grade has been properly prepared, spread a layer of clean stone passing a 3 to 3½ inch revolving screen and held on a 2-inch screen to a depth sufficient when thoroughly rolled to give a thickness of 4½ inches. The thickness of this layer should be regulated by laying on the sub-grade at proper intervals, cubical blocks of wood of the proper dimensions to give the desired thickness. Stone screenings shall be spread with shovels over this layer of stone in sufficient quantity to fill the voids between the larger stones. The screenings should be spread gradually and thoroughly rolled with a road roller weighing at least ten tons. As the screenings are worked into the coarse stone under the roller more should be added here and there as voids appear. At first

the rolling should be done dry until the stone appears to be well filled, then the surface should be well sprinkled and again rolled, the rolling and sprinkling continued until the layer of stone is thoroughly compacted and no more screenings can be forced in. Just enough screenings shall be used to fill and bond the stone, leaving no surplus screenings on the top. It is better not to fill the stone quite flush, leaving the coarse particles of stone slightly projecting, so as to have a coarse, grainy base upon which to put the wearing surface.

The above method may be varied by using the crusher run of stone without the addition of any other filler where the small sizes are not in excess. Also a filler other than stone screenings, such as bank gravel or sand, may be used in some cases where experience with the materials available show better results can be obtained. Under some conditions the character of soil and stone available may be such as to require the use of any filler with the stone of the first course. The specification given, however, represents the best average practice where stone with bonding value, such as limestone, or trap rock, can be obtained.

The thickness of the pavement, including base and wearing surface, should vary according to local conditions, and should be fixed by the Engineer in charge when all the varying conditions of soil, drainage, traffic and material of construction are understood. In general, a thickness of macadam base of $4\frac{1}{2}$ inches compacted, with a wearing surface of two and one-half inches compacted will be enough for any except the most adverse conditions, when a concrete base of 4 inches thickness or a greater thickness of stone in the base should be used, as economy might determine.

TOP OR WEARING SURFACE COURSE.

Upon the base, stone passing a revolving screen with $2\frac{1}{2}$ inch openings and retained upon a revolving screen with 1 inch openings shall be spread to a depth of $2\frac{1}{2}$ inches when compacted. This course shall be dry-rolled with a road roller weighing not less than 10 tons until the individual fragments have keyed together and the surface is even and conforms to the required crown. This course should be left open or porous in order to allow the penetration of the hot bituminous cement.

BITUMINOUS CEMENT.

The bituminous cement may be either asphaltic, coal tar or water gas tar cement.

ASPHALTIC CEMENT.

The asphaltic cement may be prepared in the following manner:

1. (a) From the refined natural asphalt.
- (b) From the residue obtained by the careful distillation either with or without oxidation of asphaltic or semi-asphaltic petroleum.
- (c) From any uniform combination of the preceding materials, together with a suitable flux, if flux be necessary, such combination being subject to the approval of the Engineer.

Each bidder must state the nature and origin of the bitumen to be used by him, and further, shall submit samples of the bitumen with his proposal.

The asphaltic cement shall pass the requirements designated below: Penetration shall be from 90 to 180 at 77 degrees Fahr. (the above penetrations are measured in hundredths of a centimeter with a No. 2 needle weighted with 100 grams acting for five seconds.

The word "bitumen" shall signify any natural hydrocarbon or hydrocarbons soluble in carbon disulphide.

2. When 50 grams of the cement are maintained at a temperature of 325 degrees Fahr. for 5 hours in a tin box $2\frac{1}{4}$ inches in diameter, $1\frac{3}{4}$ inches deep, there must not be a volatilization of more than 3% by weight of the bitumen present nor shall the original penetration be reduced thereby over one-half.

3. The bitumen of the asphaltic cement shall yield upon ignition not more than 15 per cent of fixed carbon.

The method of test employed is that recommended by the Committee on Coal Analysis of the American Chemical Society.

4. Of the bitumen of the asphaltic cement which is soluble in carbon disulphide, 98½% shall be soluble in carbon tetrachloride. In this test for carbenes the asphaltic cement to be tested should be allowed to stand over night covered with purified carbon tetrachloride. The test to be performed in subdued light.

5. At 32 degrees Fahr. the bitumen of the cement shall have a penetration of not less than 8 when tested one minute with the needle weighted to 200 grams.

6. The cement shall not flash at a less temperature than 350 degrees Fahr., New York State Closed Oil Tester.

COAL TAR CEMENT.

The coal tar cement shall be a residue of the distillation of coal tar only, and shall be refined for the special purpose of making pavement.

No mixture of hard pitch with the lighter oils of coal tar will be permitted.

Its specific gravity shall be not less than 1.20 nor more than 1.29 at 60 degrees Fahr.

The melting point determined by the cube method shall be not less than 100 degrees Fahr., and not more than 115 degrees Fahr.

It shall contain not less than 15% nor more than 30% of free carbon insoluble in benzol.

It shall be free from water as determined by distillation and shall show upon ignition not more than ½% of inorganic matter.

No distillate shall be obtained lower than 338 degrees Fahr., and up to 600 degrees, not less than 5% and not more than 20% of distillate shall be obtained. The distillate shall be of a gravity of not less than 1.03 at 60 degrees Fahr. The residue shall have a melting point of not more than 165 degrees Fahr. In making this distillation an 8 ounce glass retort shall be used and the thermometer suspended so that before applying the heat the bulb of the thermometer is one-half inch above the surface of the liquid. The melting point of the pitch shall be determined by suspending a one-half inch cube in a beaker of water one inch above the bottom. The temperature shall be raised 9 degrees per minute from 60 degrees Fahr. The temperature recorded the instant the pitch touches

the bottom shall be considered the melting point of the pitch. In testing the original material the initial temperature shall be 40 degrees Fahr.

WATER GAS TAR CEMENT.

1. The specific gravity at 25° C. shall be between 1.14 and 1.16.
2. On extraction with cold carbon disulphide at room temperature for 20 minutes, not less than 98% shall be soluble.
3. When tested in a New York Testing Laboratory float test at 100° C. the float shall sink in from 20 to 24 seconds.
4. When 100 cc. are distilled in a 250 cc. Engler flask according to the method proposed by the American Society for Testing Materials, it shall show the following fractions by weight:

Start to 170° C.....	0
170 to 225° C.....	Not over 1/2%
225 to 270° C.....	From 2 to 7%
270 to 300° C.....	From 7 to 10%
Residue.....	Not less, than 82%

HEATING AND APPLYING BINDER.

The binder shall be heated in an approved heater equipped with a fixed or portable thermometer which will clearly and accurately indicate the temperature of the binder. The bituminous binder shall be heated to not less than 225 degrees Fahr., and not more than 300 degrees Fahr. for tar cement and from 300 to 400 degrees Fahr. for asphaltic cement, and shall be uniformly distributed over the macadam by suitable appliances at a rate of not less than 1¼ gallons, or more than 1¾ gallons, to the square yard. Directly after application, clean trap rock or equally satisfactory stone chips free from dust and consisting of fragments which will pass a 1-inch screen and be retained upon a ¾-inch screen, shall be spread over the surface in sufficient quantities to fill the surface voids and prevent the binder from sticking to the wheels of the roller. Care shall be exercised not to apply more stone chips than will just fill the interstices, and any surplus material shall be swept from the surface as directed. The road shall then be rolled until solid, more stone chips being applied as required in order to maintain satisfactory conditions.

A seal, flush, paint or squeegee coat of the hot binder shall be uniformly distributed over the surface at a rate of ½ to ¾ gallons to the square yard. Fine stone chips or clean gravel passing a ½-inch screen and retained on a 1-10-inch screen shall then be spread over this seal coat in just sufficient quantity to take up all excess of binder and form a smooth, well-bonded surface when rolled. The road shall be rolled until smooth and firm and to the proper lines and grades.

The Committee recommends the use of a tandem roller, weighing not less than 5 tons, for finishing the surface.

The stone must be free from dirt or dust at the time of applying the bituminous binders. The application of binder shall not be made when the atmospheric temperature is below 50 degrees Fahr., nor when the stone is wet, unless especially permitted by the Engineer.

MAINTENANCE.

The Committee recommends that the maintenance or guarantee provisions be governed by local conditions, and that the contractor guarantee the pavement as to workmanship and materials for a period of one (1) year.

HERMAN H. SCHMIDT, Chairman,
Chief Engineer Bureau of Highways, Brooklyn.

R. A. MACGREGOR,
Asst. Engineer Bureau of Highways, Manhattan, N. Y.

H. L. SHANER,
City Engineer, Lynchburg, Va.

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PRES. HARDEE: We would like to hear from the Chairman of the Committee on Stone Block Paving Specifications.

MR. RAMSAY: The Chairman had to leave the city and Mr. O'Toole was delegated to read this report. He has been called from the room, but he left the papers in my hands.

On page 26, paragraph A, change the word "coal" to read "gas" tar pitch filler. On the same page under "Filling Joints" we change the words "coal tar" to "gas tar" pitch, and on page 27, paragraph "f" is stricken out and the remaining portion of paragraph "f" is retained. Paragraph "f" relative to specific gravity at sixty degrees Fahrenheit shall be not more than 1.00. Paragraph "g" has been changed to "f" and "f" has been continued down there. This was made up by Mr. Sherrerd and I guess he has it right. Then on page 25 "the granite shall preferably be such as will give above 16,000 pounds per square inch crushing strength." This has been changed to "20,000." This same paragraph—"The touchness to be determined by the method employed by the Department of Agriculture of the U. S. Government" has been changed to read, "The touchness shall be not less than 11 as determined by the method employed by the United States Department of Agriculture, Office of Public Roads.

I move the adoption of the report. Motion seconded.

PRES. HARDEE: It is moved and seconded that the report be adopted as read. Does any gentleman desire to be heard on the report?
The question.

PRES. HARDEE: All those who favor the adoption of the report signify by saying "Aye." Contrary "No." The motion is carried and the report stands adopted.

The following is the adopted

REPORT OF THE COMMITTEE
ON
STONE BLOCK PAVING SPECIFICATIONS.

Pittsburgh, Pa., February 26, 1913.

To the President and Members of the
Association for Standardizing
Paving Specifications.

Gentlemen: Your Committee on Stone Block Paving Specifications reports as follows:

SPECIFICATIONS FOR GRANITE BLOCK PAVING.

GRANITE BLOCKS.

The paving blocks, which shall be of medium grained granite, showing an even distribution of constituent material, shall be of uniform quality and texture, without seams, scales or discolorations showing disintegration, free from an excess of mica or feldspar, and equal in every respect to the sample in the office of the Engineer.

The granite shall preferably be such as will give above 20,000 pounds per square inch crushing strength, combined with a uniform structure and toughness. The toughness shall be not less than eleven (11) as determined by the method employed by the United States Department of Agriculture, Office of Public Roads.

Blocks shall be of the following dimensions, viz: Not less than eight (8) nor more than twelve (12) inches long on top, not less than three and one-half ($3\frac{1}{2}$) nor more than four and one-half ($4\frac{1}{2}$) inches wide on top, not less than five (5) nor more than five and one-half ($5\frac{1}{2}$) inches deep.

The blocks shall be so dressed that after laying, a measurement of the individual joint shall show a width of not more than one-half ($\frac{1}{2}$) inch at top and for a depth of one (1) inch and a width of not more than one (1) inch in any other part of the joint. The head of the block shall be so cut that it shall not have more than three-eighths ($\frac{3}{8}$) inch depression from a straight edge laid in any direction across the head and held parallel to the general surface of the block.

Not more than one drill hole shall show on the head of the block and none on the ends, an allowance of not over an average of one block, showing drill hole on side, shall be permitted to a square yard.

Care shall be exercised in handling the blocks so that the edges and corners shall not be chipped or broken, as blocks otherwise acceptable may be rejected on account of spawling.

The blocks shall be sorted and laid in courses of uniform width except in special cases, as may be ordered.

SUB-FOUNDATION.

Any soft and spongy material below the sub-grade shall be removed and filled, as directed by the Engineer, with sand, gravel or other material satisfactory to the Engineer, and thoroughly rammed or rolled. (When

such extra fill exceeds 5 cubic yards payment shall be made for the excess.) In excavating, care shall be taken not to disturb the sub-foundation, except where necessary to remove the soft and spongy material.

The entire sub-foundation shall be compact and hard and the contractor will be required to thoroughly ram or roll it with a roller satisfactory to the Engineer.

CONCRETE BASE.

After the sub-foundation has been prepared to the satisfaction of the Engineer, a concrete foundation, six (6) inches thick, shall be laid on it. The concrete shall conform with the standard specifications for concrete for paving foundations, as determined by this Association.

The grading and sub-foundation shall be completed at least fifty (50) feet in advance of the laying of the concrete.

CUSHION COURSE.

A cushion course of dry, clean sand shall be laid on the concrete base. This cushion course shall be from one to two inches thick, to insure a uniform bearing and prevent the possibility of any part of any block resting directly on the concrete base.

On this cushion the blocks shall be laid as closely as possible, each block touching the adjoining block on sides and ends, in courses of uniform width. All joints shall be broken with a lap of at least three inches.

FILLING JOINTS.

Depending upon the kind of filler to be used in the joints, the following specifications, A, B, or C, shall govern the use of gas tar pitch (A), bituminous asphalt (B), or cement grout (C).

(A) GAS TAR PITCH FILLER.

Immediately after the blocks are laid, sufficient coarse hot gravel shall be spread over the surface and swept into the joints so as to fill the space between the blocks to a depth of about two inches from the bottom.

The blocks shall then be rammed to thoroughly settle and compact the first layer of gravel in the joints and so as to leave no blocks above or below the general surface of the finished pavement.

The joints shall then be poured one-half full with a gas tar pitch filler as hereinafter described and then filled to within one-half inch of the surface with hot gravel and again poured with the filler, this last pouring shall be flush with the tops of the blocks at the joints. The final pouring of the filler shall be immediately followed with a sufficient amount of hot gravel, applied at the joints, to conceal the filler. The gravel shall be clean, washed gravel between one-eighth and three-eighths inch in its largest dimension, not over 25% of which shall be of the three-eighths inch size.

The filler shall also comply with the following test requirements:

- (1) It shall have a specific gravity between 1.23 and 1.33 at 60 degrees Fahr.
- (2) It shall have a melting point between 120 and 130 degrees Fahr.
- (3) It shall contain between twenty (20) and thirty (30) per cent of free carbon.

The coal tar pitch filler shall be used on the work at a temperature of not less than 250 degrees Fahr., and shall at no time be heated above 325 degrees Fahr.

In applying the gravel and pitch, care shall be taken that the pavers are closely followed by the filler gang, and in no case shall the paving be left over night (or when work is stopped) without the filler being completed. In case of rain stopping the filler gang before its work is finished, the joints shall be protected by the use of tarpaulins or other means so as to keep out water, and under no circumstances shall the filler be poured into wet joints.

(B) ASPHALT FILLER.

Immediately after the blocks are laid, sufficient coarse hot gravel shall be spread over the surface and swept into the joints so as to fill the space between the blocks to a depth of about two inches from the bottom.

The blocks shall be rammed to thoroughly settle and compact the first layer of gravel in the joints and so as to leave no blocks above or below the general surface of the finished pavement.

The joints shall then be poured one-half full with a bituminous filler as hereinafter described, and then filled to within one-half inch of the surface with hot gravel and again poured with the filler; this last pouring shall be flush with the surface of the blocks at the joints. This final pouring of the filler shall be immediately followed with a sufficient amount of hot gravel applied at the joints to cover the filler.

The gravel shall be clean, washed gravel, between one-eighth and three-eighths inch in its largest dimension, not over 25% of which shall be of three-eighths inch size.

The asphalt filler to be used in filling the joints between and around the paving blocks and bridge stones shall be a bituminous material, either natural or artificial, entirely free from coal tar, or any product of coal tar distillation.

It shall be waterproof, free from water or decomposition products, shall adhere firmly to the paving stones, and shall remain ductile and pliable at all climatic temperatures to which it may be subjected in actual use, and shall not run in the joints in the hottest temperature of summer, nor become hard or brittle through the action of frost.

The asphalt filler shall conform with the following requirements:

(a) It shall contain not less than 98% pure bitumen soluble in carbon disulphide.

(b) Of the total amount soluble in carbon disulphide 98½% shall be soluble in carbon tetrachloride.

(c) When tested by the Dow method for one minute with a No. 2 needle weighted with 200 grams and operating for one minute at 32 degrees Fahr. it shall have a penetration greater than 25.

(d) When tested for five seconds with a No. 2 needle weighted with 50 grams and operating for five seconds at 115 degrees Fahr. it shall have a penetration not greater than 110.

(e) When tested for five seconds with a No. 2 needle weighted with 100 grams and operating for five seconds at 77 degrees Fahr. it shall have a penetration between the limits of from 25 to 60.

(f) One-half ($\frac{1}{2}$) gramme of the material when made into a ball shall not melt and drip through an aperture one millimeter in diameter at less than 200 degrees Fahr.

The paving cement shall be heated on the work to a temperature of not less than 375 degrees Fahr., nor more than 425 degrees Fahr., in such quantities as will allow of this temperature being maintained in the kettle during progress of the pouring, and no cement the temperature of which is less than 375 degrees Fahr. shall be used.

It shall then be put into a conical can and poured into the joints as hereinbefore described.

It shall be delivered on the work at least one week before being used and in sufficient quantities to allow of suitable samples for examination and analysis, and such samples shall conform with the above requirements.

All the joints between the stones shall be filled with this hot paving cement, continuing the pouring until the joints are entirely filled, but no flushing of the pavement shall be permitted.

In applying the gravel and bitumen, care shall be taken that the pavers are closely followed by the filler gang, and in no case shall the paving be left over night (or when work is stopped) without the filler being completed. In case of rain stopping the filler gang before its work is finished, the joints shall be protected by tarpaulins or other means, so as to keep out water, and under no circumstances shall the filler be poured into wet joints.

(C) CEMENT GROUT FILLER.

Immediately after the blocks are laid, sufficient gravel shall be spread over the surface and swept into the joints so as to fill the space between the blocks to a depth of about two inches from the bottom.

The blocks shall then be rammed to thoroughly settle and compact this layer of gravel in the joints and so as to leave no blocks above or below the general surface of the finished pavement.

After the pavement has been brought to a uniform surface Portland cement grout shall be poured into the joints until it appears on the surface. The grout shall be broomed into the joints, if necessary to fill the same, and the operation shall be continued as the grout settles, until the joints are thoroughly filled flush with the surface of the blocks, immediately after which the entire pavement shall be broomed to a smooth surface, sufficient grout being applied to bring said surface even with the highest part of any of the blocks. The blocks shall be wetted by sprinkling immediately before applying the grout, if the condition of the atmosphere requires this precaution to be taken.

The cement grout shall be composed of one measure of the best quality of freshly burned Portland cement to one measure of clean, sharp sand. In the mixing of the cement and the sand, clean, fresh water shall be used, to give a proper consistency; care shall be taken not to use an excess amount of water.

The grout shall be mixed for this purpose, either in a machine mixer, to be approved by the Engineer, or in a box about 4 feet 8 inches long,

30 inches wide and 14 inches deep, resting on legs of different length, so that the mixture will readily flow to one corner of the box, the bottom of which shall be about 3 inches above the pavement. Particular attention is called to the importance of ascertaining the proportional amount of water to be used with the mixture of different kinds of cement and sand to give the best results, and when the most advantageous proportions have been ascertained these shall be used. The mixture shall be removed from this box to the street surface with scoop shovels, all the while being stirred in the box as the same is being emptied. One such box shall be provided for about each ten feet in width of the roadway. The work of filling shall be carried forward until an advance of fifteen or twenty yards has been laid. When the same force and appliances shall be used to re-grout the same space in a like manner except that the proportions of the mixture for this second application shall be two parts of Portland cement to one part sand. The work shall be kept lightly sprinkled with water on the surface ahead of the sweepers by means of a sprinkling can, or other suitable device, to avoid a possibility of causing the grouting to become too thick at any point. To insure the penetration of the grout into the joints of the pavement there shall be used, in addition to the brooms, a squeegee scraper fifteen to eighteen inches in length on the last application of the grout.

Within one-half to three-quarters of an hour after the last coat has been applied and the grout between the joints has fully subsided and the initial set is taking place, the whole surface shall be lightly sprinkled with water and the surplus mixture left on the top shall be swept into the joints, bringing them up flush and full. After the grouting is done and a sufficient time for hardening has elapsed, so that a coating of sand will not absorb any moisture from the cement mixture, one-half inch of sand shall be spread over the whole surface, in case the work is subjected to a hot summer's sun, in which case an occasional sprinkling to dampen the sand shall be made for two or three days. After the grouting is completed the street shall be kept closed and no carting or traffic allowed until at least seven days have elapsed on any portion of the street grouted, and the face of the pavement shall be kept moist if the condition of the weather requires this precaution, as may be directed by the Engineer. Should the bond between the blocks become broken for any reason during the progress of the work the joints shall be cleaned out, even if it is necessary to take up and relay the blocks, and such part so taken up and relaid shall be regrouted and rebarricaded.

The period of guarantee for granite block pavement need not exceed one year.

Respectfully submitted,

M. R. SHERRERD, Chairman,
Chief Engineer, Board Street and Water Commissioners, Newark, N. J.

JOHN F. O'TOOLE, Vice-Chairman.
Supt. Highways and Sewers, Pittsburgh, Pa.

C. A. FINLEY,
Supt. Bureau of Water, Pittsburgh, Pa.

JOHN E. RAMSAY,
Consulting Engineer, Salisbury, N. C.

PRESIDENT HARDEE: We would like to have the report of the Auditing Committee, Mr. Secretary.

MR. HITTELL: (Reads:)

Gentlemen: Your committee, appointed to audit the accounts of the Secretary-Treasurer, presents the following report:

The books and vouchers of the Treasurer are O. K. and show the report of said officer made to the convention to be correct, and that the balance due the association (as of February 22, 1913) is Six Hundred and Five and 26/100 (\$605.26) Dollars, which amount is on deposit with The La Salle Street Trust and Savings Bank of Chicago to the credit of the Association.

M. R. SHERRERD,
GEO. W. TILLSON,
E. H. CHRIST,
Committee.

PRESIDENT HARDEE: It is moved and seconded that the report be adopted. Are there any objections? The Chair hears none. It is so ordered.

We would like to have the report of the Committee on Nominations.

MR. TILLSON: The Secretary has it.

MR. HITTELL: (Reads:)

Gentlemen: Your committee appointed for the purpose of selecting officers for the ensuing year hereby recommend the election of the following gentlemen:

For President, N. S. Sprague, of Pittsburgh.

For First Vice-President, Nelson P. Lewis, of New York.

For Second Vice-President, George W. Tonson, of Toledo.

For Third Vice-President, Linn White, of Chicago.

For Fourth Vice-President, W. L. Hempelmann, of St. Louis.

For Secretary-Treasurer, John B. Hittell, Chicago.

All of which is respectfully submitted.

GEO. W. TILLSON,
HENRY C. ALLEN,
ELLIS R. DUTTON,
W. L. HEMPELMANN,
MORRIS R. SHERRERD,
Committee.

PRESIDENT HARDEE: Gentlemen, you have heard the report. In the absence of any other nominations I believe it would be in order to make the election all at one time.

MR. TILLSON: I would like to say, in regard to Mr. Hempelmann, who was on the committee and is nominated for Fourth Vice-President, that he objected quite seriously to having his name used, but he was unanimously overruled by the committee. I therefore make a motion that the Secretary be authorized to cast the vote of the association for the names presented.

Motion seconded.

PRESIDENT HARDEE: It is moved and seconded that the Secretary be authorized and directed to cast the vote of the entire association for the officers who have been nominated by the Nominating Committee. Does the Chair hear any objections to the motion? Hearing none, the motion is adopted.

MR. HITTELL: The vote is so cast, Mr. President.

PRESIDENT HARDEE: The Chair announces that the vote is so cast.

Gentlemen of the Association, I feel you have made no mistake in selecting for your presiding officer, our distinguished friend, Mr. Sprague of Pittsburgh. And it is now with pleasure and no regret that I turn over the reins of government to you, Mr. Sprague.

(Retires from Chair.)

PRESIDENT SPRAGUE (in the Chair): Mr. President and gentlemen of the convention, I think that after last evening this is a pretty severe task to impose upon me so early in the morning. I refer to the task of making a few brief remarks which I presume is customary after the honor which has been conferred upon me this morning, and I presume I will have to abide by the well established precedent of Presidents when they are elected to office. It is needless for me to say that I have a very keen sense of appreciation of the honor which has been conferred upon me by electing me to this high office of this association. I trust that I may have, and I solicit, the entire co-operation and support of all of the members of the association and I sincerely hope that in the management of the affairs of this association that I will at least be able to sustain the reputation and the ability which has been displayed by its former Presidents. Now, Mr. Chairman, I will be through in a minute. I want to say to you gentlemen of this convention, that we are very glad that you could meet with us in Pittsburgh this year. I regret, however, that the inclemency of the weather has prevented you from seeing many of the sights of our city, but I trust that it will not be long, as has already been suggested by our Mayor, before you

will return to Pittsburgh and make us another visit. I thank you.

Gentlemen, is there anything before this convention in the way of business?

MR. TILLSON: Mr. President, before we adjourn, I want to move a vote of thanks to our retiring President, Capt. Hardee, for the ability and uniform courtesy with which he has conducted his business and the treatment he has given to the members during the present meeting and the past year.

Motion seconded.

MR. SPRAGUE: The vote is unanimous. (Three cheers.)

CAPT. HARDEE: I was waiting for you to become seated before I would rise to acknowledge the honor you have done me in the adoption of Mr. Tillson's motion, and I can say I very much appreciate it. I believe that if we can possibly do it, this association should be continued, and I really hope that it will, because, as I said to my people at home, if we don't accomplish anything more, although we are accomplishing a great deal more, I believe the fact that we meet from the different sections of the country, become personally known to each other, must be of great advantage to us personally and professionally, but more particularly to the cities we represent in the organization. And I do hope, that while I have had rather a divided opinion throughout the year on the matter of amalgamation, I believe that the best interests of the cities we represent will be subserved if we can keep our organization intact. If I were the orator that my predecessor, Mr. Tillson, has always shown himself to be, there are many kind and lovely things I would like to say to you. But I know the hour is growing late, we have an entertainment engagement for this afternoon, I know every one wants to get some lunch before they go, so I am going to retire, again reiterating my thanks for the kindness and the courtesy that has been shown me by all of the members of the association and the prompt response they always made to any communication I addressed to them, and the hope, Mr. President, that you will find the duties of your office as pleasant but less onerous than they have been to me. Gentlemen, I thank you.

MR. ALLEN: Mr. President, I move that there be extended to the city administration, the Chamber of Commerce and the ladies and gentlemen of Pittsburgh, who have so finely entertained us, a vote of thanks of this association, and also, we include in it the Pennsylvania Railroad, for the treat-

ment they have accorded this association upon its visit to Pittsburgh this year. I think I voice the opinion and sentiment of the association when I say that it deeply appreciates all of this kind treatment.

Motion seconded.

PRESIDENT SPRAGUE: Gentlemen, you have heard the motion. It has been made and seconded. Are there any remarks?

All those in favor of the motion, please give their consent by saying "Aye." We will take a rising vote. (All rising.) The vote is unanimous.

CAPT. HARDEE: The Heinz Company was very kind in extending, through the Chamber of Commerce to the delegates of this association an invitation to visit their plant this morning, which I am sure would have been very pleasant, and very instructive; but unfortunately, due to the fact that we did not complete our business yesterday, necessitating a session this morning, that engagement had to be cancelled. I am told by the committee of the Chamber of Commerce that quite extensive preparations had been made; they had menu cards, a beautiful lunch, and a band of music, and other things that would have made our visit to the Heinz 57 varieties plant so extremely pleasant, and while as the head of the association I expressed my regret to those gentlemen and asked that it be conveyed to the Heinz people of our inability to fulfill our engagement with them, or fulfill the acceptance of their invitation, I feel that under the circumstances this association should officially recognize the kind and courteous invitation which they extended and to officially express their regret; so I do now move that the Secretary be directed on behalf of the association to write a communication to the Heinz people expressing regret and stating the conditions which made it impossible for us to accept their kind invitation.

Motion seconded; carried by a unanimous rising vote.

MR. KINGSLEY: During all of these nice eulogistic remarks, there is one gentleman in the room who has looked rather downcast, and I think rightly so; there is one gentleman to whom this association owes a great deal, and I think leaving here without paying our respects to this gentleman will be leaving a duty undone. Therefore I move that the association extend to Mr. Hittell the heartiest congratulations over the success of this meeting and its thanks for the work he has done the past year and at this session.

Motion seconded.

PRESIDENT SPRAGUE: The motion is carried unanimously.

MR. BABCOCK: I don't know, Mr. President, whether this is the proper time for me to speak or not, but I come here with an invitation from the City of Buffalo, extended to our association for the next meeting. I believe the whole subject is to be referred to the Executive Committee, but I have a letter from the Mayor and the Chamber of Commerce. I personally saw the Secretary of the Chamber of Commerce, and told him what our situation was, that we were considering an amalgamation with the other society and might not meet at all; but if we do meet and it is practical to come to Buffalo, I hand you this invitation from His Honor, the Mayor.

MR. HITTELL: (Reads:)

Mayor's Office, City of Buffalo.

February 18, 1913.

To the President and Members of the
Association for Standardizing
Paving Specifications.

Gentlemen: It gives me great pleasure, on behalf of the City of Buffalo with its half million population, to extend to you a hearty invitation to hold your next session in our city.

We believe that we have much here to interest you, and we are confident that if you select Buffalo for your gathering, we will be in a position to make your meeting one of the most successful in the history of your association.

Personally, it will be a pleasure to me to do everything in my power to assist in making your session successful in every way and satisfactory to all your members.

Yours very truly,

L. P. FUHRMANN,
Mayor.

Buffalo Chamber of Commerce,
Office of the President.

February 18, 1913.

To the President and Members of the
Association for Standardizing
Paving Specifications.

Gentlemen: On behalf of the Chamber of Commerce, an organization of three thousand business and professional men, I take pleasure in extending to you an invitation to hold your next convention in this city.

We will be glad to provide an adequate meeting place for you, free of charge, and to assist in every way pos-

sible to make your session successful. Buffalo is splendidly supplied with hotels, and can meet any need that may be imposed upon us, hotel rates being guaranteed by the Chamber of Commerce, and never raised because of a convention.

It is hardly necessary to point out to you the convenient location of Buffalo for members coming to the convention from any part of the United States, our railroad connections being unexcelled.

Buffalo has many attractions for visitors with Niagara Falls in close proximity, parks, art galleries, museums, etc.

If you honor Buffalo by selecting it for your next meeting place, I am confident you will never have cause to regret your decision.

Yours very truly,

BUFFALO CHAMBER OF COMMERCE,
HERBERT A. MELDRUN, *President*.

*Which communications were on motion referred to the Executive Committee.

MR. SIBLEY: Although I have not been delegated to represent the Associate Members as a body, I am sure I express their feelings when I express to this association our pleasure at the uniform courtesy which has been extended to the representatives of the Associate Members, both in committee hearings and on the floor at the meetings, and we wish to express our appreciation for the attitude with which our suggestions and recommendations have been received and the consideration that has been given them.

MR. CUTTER: Mr. President, I want to second Mr. Sibley's expression of thanks and to say that while we do not always get what we think we are entitled to, at least we are given a fair opportunity to tell what we want, and we all very much appreciate that.

*Telegram: San Francisco, Cal., February 28, 1913.

To the President and Members of the
Association for Standardizing
Paving Specifications.

San Francisco sends greetings and a most cordial invitation to hold the 1915 convention of your organization in San Francisco. In that year San Francisco will greet the people of all the United States and the nations of the world at its great exposition and your association could not serve its purpose better than to assemble here where it will have the greatest opportunity to arouse interest in its efforts. San Francisco hopes to welcome you as its guest in 1915.

JAMES ROLPH, JR.,
Mayor.

PRESIDENT SPRAGUE: There being no further business before this convention, I want to announce the meeting of the Executive Committee in this room immediately after adjournment. Under the rules of the organization, the Executive Committee consists of past presidents, the officers just elected and the chairmen of committees.

I want to call your attention to the trip this afternoon to the city filtration plant at Aspinwall. There will be a special train leave at 2:30 o'clock from the Pennsylvania station and we want you all to go. We have a plant there which you may have heard about, and there is no need of my telling you anything about it here this morning. Then this evening there is another program of entertainment, a visit to the Carnegie museum and technological schools, and we would like to have you all attend that. Special cars will be provided for the purpose, and the local committee is anxious that there be a good attendance at all of these functions. You are all welcome, and we want to see all of you on these trips. The time is 7:30 this evening. The excursions for tomorrow have not been cancelled.

On motion duly seconded and carried the meeting was adjourned.

MEETING OF EXECUTIVE COMMITTEE.

THURSDAY, FEBRUARY 27, 1913.

Present: Mr. Sprague, Capt. Hardee, Mr. Tillson, Mr. Tonson, Mr. Christ, Mr. Babcock, Mr. Allen, Mr. Schmidt, Mr. Hempelmann, Mr. Hittell.

Absent: Mr. Lewis, Mr. Sherrerd, Mr. White, Mr. Fowler.

MR. R. H. PARKER: I want to talk informally, briefly. It is a matter of some prospective importance. I represent the newest Associate Member, and yet I have been long interested in this convention. I have come the farthest—from California—and glad to come, and come on the same terms. Presumably you will decide on the time and place of next meeting. I would like to submit, representing the California material men, the city officials of California, the State, the desirability, and perhaps the extreme desirability, of making San Francisco your meeting place in 1915. Some of you have been there and there will be more in 1915. I submit it for your consideration.

PRESIDENT SPRAGUE: We will be glad to consider it.

MR. PARKER: I thank you for your consideration.

On motions made, duly seconded and carried, it was ordered:

THAT, The time and place for the next meeting of the association will be determined according to the action of the association as published on page 34

THAT, The Secretary be instructed to have the proceedings copyrighted and the price fixed at \$5.00 per copy to all not members of the association.

THAT, The Secretary be instructed to have 800 copies printed.

THAT, The same distribution be authorized as previously, to-wit:

10 copies to each city whose membership dues are \$50.00.

5 copies to each city whose membership dues are \$25.00.

10 copies to each Associate Member.

1 copy to each technical journal on application.

1 copy to each technical library or engineering association on application.

THAT, A copy be sent to the Mayor of Pittsburgh with his name on it.

THAT, An assessment be levied upon all cities of the first class of \$25.00; of the second class, of \$15.00; and on Associate Members, except those who were admitted at this meeting, of \$25.00.

THAT, The Secretary-Treasurer be authorized to pay any deficit which may exist in the fund of the Entertainment Committee and any other expenses of this meeting.

THAT, The Secretary-Treasurer be empowered to pay such legitimate bills as may come up throughout the year, as well as the running expenses of the association.

THAT, The Secretary-Treasurer be authorized to pay the official reporters for their services, in addition to their traveling and hotel expenses; said compensation to be determined by the President and the Secretary-Treasurer.

THAT, The Secretary-Treasurer be authorized to print the tentative reports prior to the next meeting, same to be furnished to members and Associate Members only.

THAT, The Chairmen of the various standing committees be authorized to expend whatever amount may be necessary in connection with their work as such.

THAT, The Executive Committee direct the President to officially request the Mayor of Chicago to permit Miss Louise Chandler and Miss Alice M. Carr to attend the fifth meeting as the official reporters at the expense of the association.

On motion of Capt. Hardee, the Executive Meeting adjourned to meet on Friday morning at an hour to be fixed, depending on the possibility of making the trip up Mount Washington.

MEETING OF THE EXECUTIVE COMMITTEE.

FRIDAY, FEBRUARY 28, 1913.

11:00 A. M.

Present: Mr. Sprague, Capt. Hardee, Mr. Tillson, Mr. Tonson, Mr. Schmidt, Mr. Allen, Mr. Babcock, Mr. Hempelmann, Mr. Hittell.

Absent: Mr. Lewis, Mr. Sherrerd, Mr. Christ, Mr. White, Mr. Fowler.

Applications of The Equitable Asphalt Maintenance Company of Kansas City, The Dunn Wire-Cut-Lug Brick Company, and the Yellow Pine Manufacturers, received and ordered to be included as of a former meeting.

MR. TILLSON: I move that a sub-committee of three, of which the President, shall be one, be appointed to take up the matter of amalgamation, but before any definite proposition is submitted to the American Society of Municipal Improvements, it shall be submitted to this Executive Committee and that they have authority to make a proposition to the American Society of Municipal Improvements only upon the majority vote of this committee.

Motion duly seconded and carried.

The following conditions were stipulated as terms under which amalgamation might take place:

(1) That the committees appointed at the next meeting of the American Society of Municipal Improvements include the members of our corresponding standing committees.

(2) That the Chairman of the Committee on Standard Specifications appointed at the first joint meeting be selected from among the past presidents of this association.

MR. TILLSON: Moved that one of the conditions be the same as was included in the communication to the American Society at its Dallas meeting, viz., as regards the relative representation of this association with the American Society on their paving committees.

Motion duly seconded and carried.

MR. HITTELL: Moved that the next Chairman of their general paving committee be an officer or ex-officer of this association.

Motion duly seconded and carried.

PRESIDENT SPRAGUE: Appoints Mr. Tillson, of Brooklyn, and Mr. Babcock, of Buffalo, as members of the sub-committee.

On motion of Capt. Hardee the meeting stood adjourned subject to the call of the Chair.

ARTICLES OF ORGANIZATION
OF THE
ASSOCIATION FOR STANDARDIZING
PAVING SPECIFICATIONS.

1. The name of the organization shall be "Association for Standardizing Paving Specifications."

2. Membership in the Association shall be limited to such cities as shall meet the general requirements hereinafter provided. Individual membership shall consist of such City Officials as may be regularly appointed by the Mayor, or other proper officer or Board, of Cities members of the Association. Provided, however, that the Executive Committee may continue in individual membership any person who may, at one time, have been a regularly accredited delegate to the Association, and who shall have severed his official connection with the City member, if in the opinion of the Committee, his services to the Association shall merit such membership.

3. Any person, organization or company, interested in the work of the Association, may, on the recommendation of the Executive Committee, be admitted as an Associate Member; such member shall, however, have no vote in the Association.

4. On the floor of the meetings of the Association, each City shall be entitled to one vote, provided that if the delegation from any city be divided, a fractional vote shall be recorded.

5. On the floor of meetings of the Association, ten Cities shall constitute a quorum; during meetings a majority of a committee shall constitute a quorum thereof; after the adjournment of a meeting, three members of a committee shall constitute a quorum thereof.

6. The officers of the Association shall be a President, four Vice-Presidents and a Secretary-Treasurer, each of said officers to serve for a period of one year.

7. There shall be an Executive Committee, composed of all the officers of the Association, the chairman of each of the standing committees, and past Presidents of the Association. The President shall be ex-officio Chairman of said committee.

8. In the event of a vacancy in the office of the President, the same shall be filled by a two-thirds vote of the Executive Committee, and in the event of vacancy in any of the other offices or Chairmanships of committees, the same shall be filled by appointment by the President.

9. The following standing committees shall be appointed by the President. He shall also designate the Chairman and Vice-Chairman of such committee. Between meetings of the Association, committees shall each consist of five members. At meetings they may be expanded in the discretion of the President.

Asphalt Paving Specifications.

Brick Paving Specifications.

Wood Block Paving Specifications.

Stone Block Paving Specifications.

Bituminous Concrete Paving Specifications.

Cement and Concrete Paving Specifications.

Macadam Specifications.

Bonds and Guarantees.

10. Each City upon joining the Association shall pay a membership fee of Fifty Dollars (\$50.00), except where the population of the City be less than 100,000, in which case, the membership fee shall be Twenty-five Dollars (\$25.00). Cities which have already paid such sums into the treasury of the Association shall not be required to pay any further membership fee.

11. Each Associate Member upon joining the Association shall pay a membership fee of Fifty (\$50.00) Dollars. Associate Members who have already paid such sum into the treasury of the Association shall be exempt from paying any further membership fee.

12. For the purpose of carrying on the work of the Association, necessary funds shall be provided by assessment on the Cities members and associate members in such sums as may be decided upon by the Association at Annual Meetings.

LIST OF CITIES WITH THEIR ACCREDITED DELEGATES, REPRESENTED AT THE FIRST ANNUAL MEETING OF THE
— ASSOCIATION HELD AT CHICAGO,

FEBRUARY 21-26, 1910.

ABERDEEN, South Dakota.	
A. N. ALDRICH.....	Mayor
D. C. WASHBURN.....	City Engineer
ABERDEEN, Washington.	
A. N. EWART.....	City Engineer
BALTIMORE, Maryland.	
B. T. FENDALL.....	City Engineer
BRIDGEPORT, Connecticut.	
M. F. MCKENNA.....	City Engineer
BUFFALO, New York.	
CAPT. GEORGE H. NORTON.....	Engineer Commissioner
MAJOR C. E. P. BABCOCK.....	Assistant Engineer Commissioner
CHICAGO, Illinois.	
B. J. MULLANEY.....	Secretary to Mayor
ALDERMAN BERNARD W. SNOW.....	Chairman Finance Committee
ALDERMAN PETER REINBERG.....	Chairman Council Committee
ALDERMAN GEO. F. HARDING.....	Chairman Council Committee
ALDERMAN DENNIS J. EGAN.....	Chairman Council Committee
ALDERMAN WM. H. BLENCOE.....	Chairman Council Committee
JOHN J. HANBERG.....	Commissioner Public Works
FRANK T. FOWLER.....	Superintendent of Streets
WALTER G. LEININGER.....	Assistant Superintendent of Streets
ALBERT F. KEENEY.....	President Board of Local Improvements
JOHN MINWEGEN.....	Member Board Local Improvements
FELIX A. NORDEN.....	Member Board Local Improvements
VINCENT J. JOZWIAKOWSKI.....	Member Board Local Improvements
CHARLES A. V. STANDISH.....	Secretary Board Local Improvements
C. D. HILL.....	Engineer Board Local Improvements
JOHN B. HITTILL.....	Chief Street Engineer Board Local Improvements
NICHOLAS E. MURRAY.....	Supt. Sidewalks Board Local Impvts.
LESTER KIRSCHBRAUN.....	Asphalt Chemist Board Local Impvts.
WILLIAM F. HARVEY.....	Asst. Engineer Board Local Impvts.
CHICAGO PARKS—West.	
A. C. SCHRAEDER.....	Superintendent and Engineer
CHICAGO PARKS—South.	
J. F. FOSTER.....	Superintendent
H. S. RICHARDS.....	Assistant Superintendent
LINN WHITE.....	Engineer
CINCINNATI, Ohio.	
H. F. SHIPLEY.....	City Engineer
HUGH L. CONWAY.....	Engineer Street and Sewer Repairs
CLEVELAND, Ohio.	
A. B. LEE.....	Director Public Service
COLUMBUS, Ohio.	
HENRY MAETZEL.....	City Engineer
H. S. HOLDEN.....	Director Public Service
DAYTON, Ohio.	
JOHN C. ELY.....	Director Public Service
FRED J. CELLARIUS.....	City Engineer
DES MOINES, Iowa.	
JOHN MAC VICAR.....	Supt. Streets and Public Improvements
ROBERT BRENNAN.....	City Solicitor
J. M. BURROWS.....	Assistant Engineer

DULUTH, Minnesota.

THOMAS F. MCGILVRAY.....City Engineer

GRAND RAPIDS, Michigan.

LOUIS W. ANDERSON.....City Engineer

CHARLES E. NORTON.....Member Board of Public Works

EDWARD H. CHRIST.....Member Board of Public Works

GREEN BAY, Wisconsin.

WINFRED ABRAMS.....Mayor

W. W. REED.....City Engineer

INDIANAPOLIS, Indiana.

G. A. SCHRAEDER.....President Board of Public Works

H. W. KLAUSMANN.....City Engineer

KANSAS CITY, Missouri.

ROBT. W. GOODNOW.....Secy. Board Public Works

J. L. DARNELL.....City Engineer

FRED N. BINGHAM.....Asphalt Chemist

MEMPHIS, Tennessee.

J. H. WEATHERFORD.....City Engineer

MILWAUKEE, Wisconsin.

CHARLES J. POETSCH.....City Engineer

L. A. JANSEN.....Commissioner of Public Works

J. P. SCHERER.....Commissioner of Public Works

A. J. GRUNDMAN.....Commissioner of Public Works

MINNEAPOLIS, Minnesota.

ANDREW RINKER.....City Engineer

ELLIS R. DUTTON.....Assistant City Engineer

NASHVILLE, Tennessee.

W. W. SOUTHGATE.....City Engineer

PATRICK CLEARY.....Superintendent Streets

E. L. LEWIS.....

ROBERT CREIGHTON.....

NEWARK, New Jersey.

MORRIS R. SHERRERD.....Chief Engineer Dept. Public Works

WILLIAM MUNGLE.....Board of Public Works

NEW ORLEANS, Louisiana.

GEORGE S. SMITH.....Commissioner Public Works

CAPT. W. J. HARDEE.....City Engineer

NEW YORK, New York.

OTTO H. KLEIN.....Chief Engineer, Commissioners of Accts.

GEORGE W. TILLSON.....Chief Engineer Bureau of Highways,
Manhattan**OMAHA, Nebraska.**

GEORGE W. CRAIG.....City Engineer

A. C. KUGLE.....Member City Council

PEORIA, Illinois.

E. M. WOODRUFF.....Mayor

PHILADELPHIA, Pennsylvania.

WILLIAM R. BENSON.....Chief, Bureau of Highways

WILLIAM H. BROOKS.....Asst. Commissioner of Highways

PITTSBURGH, Pennsylvania.

JOSEPH A. ARMSTRONG.....Director Dept. Public Works

N. S. SPRAGUE.....Supt. Bureau of Construction

ST. JOSEPH, Missouri.

W. K. SEITZ.....Assistant City Engineer

H. R. PETERMAN.....Assistant City Engineer

ST. LOUIS, Missouri.

JAMES C. TRAVILLA.....Street Commissioner

J. A. HOOKE.....Asst. Sewer Commissioner

MONT SCHUYLER.....Engineer of Tests

ST. PAUL, Minnesota.	
L. W. RUNDLETT.....	Commissioner Public Works
SALT LAKE CITY, Utah.	
GEORGE F. MCGONAGLE.....	City Engineer
SYRACUSE, New York.	
HENRY C. ALLEN.....	City Engineer
TOLEDO, Ohio.	
GEORGE W. TONSON.....	Chief Engineer
TRENTON, New Jersey.	
ABRAM SWAN, JR.....	City Engineer
THOMAS P. WRIGGINS.....	Chairman Street Committee
WAUKEGAN, Illinois.	
B. P. THACKER.....	Superintendent Public Works

LIST OF CITIES WITH THEIR ACCREDITED DELEGATES REPRESENTED AT THE SECOND ANNUAL MEETING OF THE ASSOCIATION HELD AT NEW YORK

JANUARY 10-14, 1911.

ABERDEEN, South Dakota.	
No delegate.	
ABERDEEN, Washington.	
No delegate.	
AKRON, Ohio.	
JOHN W. PAYNE.....	City Engineer
ARDMORE, Oklahoma.	
L. J. MYERS.....	City Engineer
BALTIMORE, Maryland.	
B. T. FENDALL.....	City Engineer
BOSTON, Massachusetts.	
JAMES H. SULLIVAN.....	Deputy Superintendent of Streets
BRIDGEPORT, Connecticut.	
M. F. MCKENNA.....	City Engineer
BUFFALO, New York.	
No delegate.	
CHARLESTON, West Virginia.	
W. A. HOGUE.....	City Engineer
CHESTER, Pennsylvania.	
ALBERT F. DAMON, JR.....	Consulting Engineer
CHICAGO, Illinois.	
*JOHN MINWEGEN.....	Member Board of Local Improvements
JOHN BURNS.....	Member Board of Local Improvements
FELIX A. NORDEN.....	Member Board of Local Improvements
JOHN B. HITTELL.....	Chief Engineer of Streets, Board of Local Improvements
N. E. MURRAY.....	Superintendent of Sidewalks, Board of Local Improvements
*C. D. HILL.....	Superintendent of Sewers, Department of Public Works
LESTER KIRSCHBRAUN.....	Consulting Asphalt Chemist, Board of Local Improvements
WALTER G. LEININGER.....	Assistant Superintendent of Streets, Department of Public Works
M. H. WEST.....	Secretary and Superintendent of the Commissioners of Lincoln Park
A. C. SCHRADER.....	Superintendent and Engineer, West Chicago Park Commissioners

*Absent.

H. S. RICHARDS.....	Assistant Superintendent, South Park Commissioners
LINN WHITE.....	Engineer, South Park Commissioners
DAYTON, Ohio.	
J. C. ELY.....	Director of Public Service
F. J. CELLARIUS.....	City Engineer
DES MOINES, Iowa.	
JOHN MACVICAR.....	Superintendent of the Department of Streets and Public Improvements
J. M. BURROWS.....	Assistant Civil Engineer, Charge of Street Construction
DULUTH, Minnesota.	
No delegate.	
GRAND RAPIDS, Michigan.	
*CHARLES E. NORTON.....	Member Board of Public Works
• EDWARD H. CHRIST.....	Member Board of Public Works
HARRISBURG, Pennsylvania.	
*M. B. COWDEN.....	City Engineer
INDIANAPOLIS, Indiana.	
HARRY W. KLAUSMANN.....	City Civil Engineer
CHARLES L. HUTCHINSON.....	Member Board of Public Works
KANSAS CITY, Missouri.	
J. E. FARIS.....	Member Board of Public Works
JAMES L. DARNELL.....	Consulting Engineer
INGHRAM D. HOOK.....	Assistant City Counselor
DR. WALTER M. CROSS.....	City Chemist
LITTLE ROCK, Arkansas.	
E. A. KINGSLEY.....	Superintendent, Department of Public Works
LYNCHBURG, Virginia.	
H. L. SHANER.....	City Engineer
MEMPHIS, Tennessee.	
No delegate.	
MILWAUKEE, Wisconsin.	
H. E. BRIGGS.....	Commissioner of Public Works
CHARLES A. MULLEN.....	Superintendent of Street Construction
MINNEAPOLIS, Minnesota.	
ANDREW RINKER.....	City Engineer
MOBILE, Alabama.	
No delegate.	
NEWARK, New Jersey.	
MORRIS R. SHERRERD.....	Chief Engineer, Dept. of Public Works
WILLIAM MUNGLE.....	President of the Board of Street and Water Commissioners
NEW HAVEN, Connecticut.	
CASSIUS W. KELLY.....	City Engineer
SAMUEL A. YORK.....	Member Permanent Paving Commission
NEW ORLEANS, Louisiana.	
CAPTAIN W. J. HARDEE.....	City Engineer
NEW YORK CITY.	
NELSON P. LEWIS.....	Chief Engineer of the Board of Estimate and Apportionment.
OTTO H. KLEIN.....	Chief Engineer of the Commissioners of Accounts
S. W. HOAG, JR.....	Deputy Chief Engineer of the Department of Docks and Ferries
WILLIAM J. BARNEY.....	Secretary of the Department of Docks and Ferries

* Absent.

BOROUGH OF BRONX:

W. H. CONNELL.....Assistant Commissioner of Public Works
 R. H. GILLESPIE.....Chief Engineer of Sewers and Highways
 AMOS L. SCHAEFER.....Consulting Engineer

BOROUGH OF BROOKLYN:

H. H. SCHMIDT.....Acting Chief Engineer Bureau of
 Highways
 W. H. BROADHURST.....Chemist

BOROUGH OF MANHATTAN:

GEORGE W. TILLSON.....Chief Engineer in Charge of Bureau of
 Highways
 E. P. GOODRICH.....Consulting Engineer
 C. D. POLLOCK.....Assistant Engineer, Bureau of Highways
 FELIX KLEEBURG.....Chemist, Bureau of Highways

BOROUGH OF RICHMOND:

T. S. OXHOLM.....Engineer in Charge, Bureau of
 Engineering Construction

BOROUGH OF QUEENS:

EDWIN H. THOMES.....Assistant Engineer, Bureau of Highways

NORFOLK, Virginia.

W. T. BROOKE.....City Engineer

OMAHA, Nebraska.

GEORGE W. CRAIG.....City Engineer
 HENRY M. MILBURN.....City Asphalt Chemist
 GEORGE L. CAMPEN.....Assistant City Engineer

PHILADELPHIA, Pennsylvania.

WILLIAM R. BENSON.....Chief of the Bureau of Highways
 W. PURVIS TAYLOR.....Head of Testing Laboratory,
 Department of Public Works

PITTSBURGH, Pennsylvania.

N. S. SPRAGUE.....Superintendent Bureau of Construction,
 Department of Public Works

RACINE, Wisconsin.

No delegate.

ST. LOUIS, Missouri.

J. C. TRAVILLA.....Street Commissioner
 J. A. HOOKE.....Assistant Sewer Commissioner

ST. PAUL, Minnesota.

L. W. RUNDLETT.....Commissioner of Public Works

SALISBURY, North Carolina.

JOHN E. RAMSAY.....Consulting Engineer

SALT LAKE CITY, Utah.

G. F. MCGONAGLE.....City Engineer

SOUTH OMAHA, Nebraska.

GEORGE W. ROBERTS.....City Engineer

SPOKANE, Washington.

F. N. BINGHAM.....City Chemist

SYRACUSE, New York.

No delegate.

TOLEDO, Ohio.

GEORGE W. TONSON.....Chief Engineer, Department of Public
 Service

WAUKEGAN, Illinois.

FRANK T. FOWLER.

AMERICAN ASSOCIATION OF CREOSOTED WOOD PAVING MANUFACTURERS.

H. S. LOUD
WALTER BUEHLER*PHILIP R. SMITH
F. M. BARNARD

BARRETT MANUFACTURING COMPANY.

L. P. SIBLEY
F. S. HUTCHISON
S. R. CHURCHF. C. SHARPLESS
BURTON M. SMITH
D. T. PERRY

INTERNATIONAL ASPHALT COMPANY.

JOHN J. MCCARTHY
HENRY R. KASSON

NATIONAL PAVING BRICK MANUFACTURERS' ASSOCIATION.

J. S. BARBER
S. N. DUTY
W. T. BLACKBURN
F. G. MATTESON
G. O. FRENCHJ. W. ROBB
W. P. BLAIR
M. W. BLAIR
O. N. TOWNSEND

STANDARD ASPHALT & RUBBER COMPANY.

J. M. WOODRUFF
W. A. LEVERING

THE AMERICAN ASPHALTUM & RUBBER COMPANY.

A. J. HILL
H. B. PULLAREDWARD NICHOLAS
W. H. GARGES

THE BARBER ASPHALT PAVING COMPANY.

CLIFFORD RICHARDSON
JAMES K. MCGUIRE
C. N. FORREST

THE WARREN BROTHERS COMPANY.

GEORGE C. WARREN
J. M. HEAD
R. R. HOYT
GEORGE O. TENNEYW. STEWART SMITH
G. M. INGRAM
C. A. KENYON
R. M. HYAMS

UNION OIL COMPANY OF CALIFORNIA.

ALEXANDER SLATER
CARL ADAM
J. C. SHEFFIELDGEORGE W. LAMSON
FILMORE CONDIT

* Absent

LIST OF CITIES WITH THEIR ACCREDITED DELEGATES
 REPRESENTED AT THE THIRD ANNUAL MEETING OF
 THE ASSOCIATION HELD AT NEW ORLEANS,
 JANUARY 8-13, 1912.

ABERDEEN, South Dakota.

No delegate.

ABERDEEN, Washington.

No delegate.

AKRON, Ohio.

No delegate.

ARDMORE, Oklahoma.

No delegate.

BALTIMORE, Maryland.

No delegate.

BOSTON, Massachusetts.

No delegate.

BRIDGEPORT, Connecticut.

M. F. McKENNA.....Consulting Engineer.

BUFFALO, New York.

CAPT. GEO. H. NORTON...Deputy Engineer Commissioner.

CHAS. E. P. BABCOCK...First Assistant Engineer.

CHARLESTON, West Virginia.

W. A. HOGUE.....Consulting Engineer.

CHESTER, Pennsylvania.

No delegate.

CHICAGO, Illinois.

CLAYTON F. SMITH.....Chairman Committee on Repairs and
 Maintenance, Board of Local Im-
 provements.

FRED BURKHARDChairman Committee on Sidewalks,
 Board of Local Improvements.

JOHN B. HITTELL.....Chief Engineer of Streets,
 Board of Local Improvements.

NICHOLAS E. MURRAY...Superintendent of Sidewalks,
 Board of Local Improvements.

WALTER G. LEININGER...Assistant Superintendent Streets,
 Department of Public Works.

ARTHUR S. LEWIS.....Secretary and Superintendent,
 Commissioners of Lincoln Park.

A. C. SCHRADER.....Superintendent and Engineer,
 West Chicago Park Commissioners.

LINN WHITEEngineer South Park Commissioners.

L. A. DUMOND.....Engineer, Chicago Association of Com-
 merce.

*FELIX A. NORDEN.....

*Absent.

COLUMBUS, Ohio.

No delegate.

DAVENPORT, Iowa.

A. M. COMPTON.....City Engineer.

DES MOINES, Iowa.

No delegate.

DAYTON, Ohio.

No delegate.

DULUTH, Minnesota.

THOMAS F. MCGILVRAY.City Engineer.

GRAND RAPIDS, Michigan.

CHARLES E. NORTON....Member Board of Public Works.

EDWARD H. CHRIST.....Member Board of Public Works.

HARRISBURG, Pennsylvania.

No delegate.

INDIANAPOLIS, Indiana.

H. W. KLAUSMANN.....City Civil Engineer.

C. A. SCHRADER.....President Board of Public Works.

KALAMAZOO, Michigan.

H. A. JOHNSTON.....City Engineer.

DANIEL WALSHAssistant City Engineer.

KANSAS CITY, Missouri.

L. R. ASH.....City Engineer.

FRED GABELMANEngineer Board of Park Commissioners.

PAUL MCGEEHANEngineer of Sewers.

LITTLE ROCK, Arkansas.

E. A. KINGSLEY.....Consulting Engineer.

LYNCHBURG, Virginia.

No delegate.

MEMPHIS, Tennessee.

J. H. WEATHERFORD....City Engineer.

MILWAUKEE, Wisconsin.

No delegate.

MINNEAPOLIS, Minnesota.

ELLIS R. DUTTON.....Assistant City Engineer.

MOBILE, Alabama.

WRIGHT SMITHCity Engineer.

NEWARK, New Jersey.

MORRIS R. SHERRERD....Chief Engineer Board of Street and
Water Commissioners.H. B. O'CONNELL.....President Board of Street and Water
Commissioners.

NEW HAVEN, Connecticut.

No delegate.

NEW ORLEANS, Louisiana.

- CAPT. W. J. HARDEE.....City Engineer.
 THOMAS L. WILLIS.....Principal Assistant Engineer.
 ADAM WIRTHChemist Municipal Repair Plant.
 GEORGE S. SMITH.....Commissioner Public Works.
 I. D. MOORE.....City Attorney.
 GEORGE C. EARL.....Superintendent Sewerage and Water Board.
 J. T. EASTWOOD.....Principal Assistant Superintendent Sewerage and Water Board.
 W. C. KIRKLANDPrincipal Assistant Engineer Sewerage and Water Board.

NEW YORK CITY, New York.

- NELSON P. LEWIS.....Chief Engineer Board of Estimate and Apportionment.
 OTTO H. KLEIN.....Director Standard Testing Laboratory of City of New York.

BOROUGH OF THE BRONX:

- W. H. CONNELL.....Assistant Commissioner Public Works.**

BOROUGH OF BROOKLYN:

- GEORGE W. TILLSON....Consulting Engineer, President Borough of Brooklyn.
 *H. H. SCHMIDT.....Chief Engineer Bureau of Highways.
 *W. H. BROADHURST....Chemist Bureau of Highways.

BOROUGH OF MANHATTAN:

- FELIX KLEEBURGChemist Bureau of Highways.

BOROUGH OF RICHMOND:

No delegate.

BOROUGH OF QUEENS:

- L. C. L. SMITH.....Consulting Engineer, Borough of Queens

NORFOLK, Virginia.

- W. T. BROOKE.....City Engineer.

OMAHA, Nebraska.

- GEORGE L. CAMPEN.....Assistant City Engineer.

PHILADELPHIA, Pennsylvania.

- W. PURVES TAYLOR.....Assistant Engineer Testing Laboratory, Bureau of Surveys.

PITTSBURGH, Pennsylvania.

- N. S. SPRAGUE.....Superintendent Bureau of Construction, Department of Public Works.
 JOHN F. O'TOOLE.....Superintendent Bureau of Highways and Sewers, Department of Public Works.

PORTLAND, Oregon.

- T. M. HURLBURT.....City Engineer.

RACINE, Wisconsin.

No delegate.

*Absent.

**Beginning March, 1912, Chief of Bureau of Highways, Philadelphia.

ST. LOUIS, Missouri.

*JAMES C. TRAVILLA.....Street Commissioner.

WALTER L. HEMPELMANN.....Engineer in Charge of Bituminous Roads.

JAMES A. HOOKE.....Assistant Sewer Commissioner.

ST. PAUL, Minnesota.

No delegate.

SALISBURY, North Carolina.

JOHN E. RAMSAY.....Consulting Engineer.

JOHN WEBB.....City Engineer.

SALT LAKE CITY, Utah.

No delegate.

SOUTH OMAHA, Nebraska.

No delegate.

SPOKANE, Washington.

*A. C. BIEGLE.....

F. N. BINGHAM.....Paving Chemist.

SYRACUSE, New York.

HENRY C. ALLEN.....City Engineer.

TOLEDO, Ohio.

*JOHN R. COWELL.....Director Public Service.

GEORGE W. TONSON.....Chief Engineer Department Public Service.

PETER T. MCNERNEY...Superintendent of Streets.

*JAMES C. STAUNTON....Councilman.

WAUKEGAN, Illinois.

*J. J. DIETMEYER.....Commissioner of Streets and Public Improvements.

 ASSOCIATE MEMBERS.

AMERICAN ASSOCIATION OF CREOSOTED WOOD PAVING MANUFACTURERS.

F. M. BARNARD
WALTER BUEHLERH. S. LOUD
H. G. JENNISON

BARRETT MANUFACTURING COMPANY.

BURTON M. SMITH
P. P. SHARPLES
F. C. HUTCHINSOND. T. PERRY
S. R. CHURCH
L. P. SIBLEY

INTERNATIONAL ASPHALT COMPANY.

No Delegate.

*Absent.

NATIONAL PAVING BRICK MANUFACTURERS'
ASSOCIATION.

WILL P. BLAIR
F. L. MANNING
FREDERICK GUNSTER

STANDARD ASPHALT & RUBBER COMPANY.

WILLIAM A. LEVERING

THE AMERICAN ASPHALTUM & RUBBER COMPANY.

H. B. PULLAR
EDGAR NICHOLS
R. C. SCHULTZ

THE BARBER ASPHALT PAVING COMPANY.

CLIFFORD RICHARDSON
F. P. CAUGHLIN

THE TEXAS COMPANY.

J. H. LAPHAM
H. J. CULLINAN
W. M. KERSHAW

WARREN BROTHERS COMPANY.

C. C. WARREN
G. M. INGRAM
F. G. CUTTER

W. J. McNAMARA
E. M. ROBINSON
R. M. HYAMS

UNION OIL COMPANY OF CALIFORNIA.

CARL F. ADAM
GEORGE W. LAMSON

UNIVERSAL PORTLAND CEMENT COMPANY.

J. H. CHUBB
BLAINE S. SMITH

UNIV. OF MICHIGAN,

MAR 6 1914

